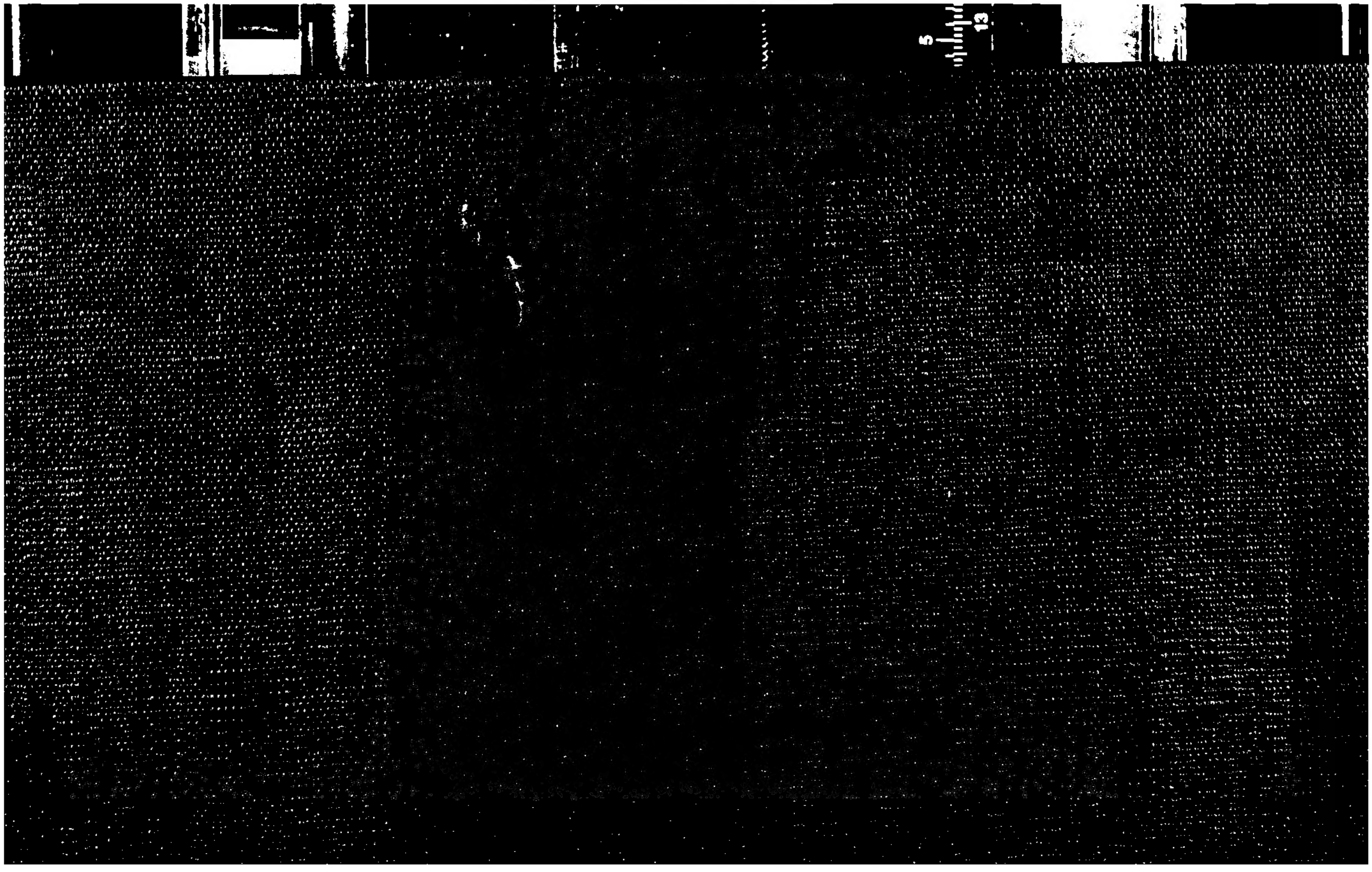

JOURNAL
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THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD
EDITOR

VOLUME 45

1944

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

FUTURE FOR BOTANISTS

RADIO listeners who tuned their instruments to the New York Botanical Garden's broadcast over WNYC the afternoon of Dec. 31 learned something of the parts that botanists are playing in many of the emergency situations that have arisen because of the war. For one thing, they heard how botanists, through their specialized knowledge of plants and how they grow, have been able to assist industries in this hemisphere when the enemy abroad had cut off the source of important plant products.

They were told how botanical explorers have been sent into the forests of tropical America to search for critical plants, such as quinine, rubber, and balsa and other woods.

Other botanists, meanwhile, along with trained horticulturists, are laying the groundwork for new industries south of us—industries which will give the western world its own supply of plant products formerly imported, mainly from the Orient. While these are chiefly fibers and medicines, they also include other needed products, such as insecticides, for which new and extended uses are being found today.

The exploration of tropical America, which is going on now at an increased pace—exploration for plants in general, as well as for specific materials—is likely to result in still greater growth of enterprises which depend upon the culture of plants.

In this coming industrial development, the knowledge of botanists will be needed for the discovery and selection of plants that can be adapted to new uses; for breeding strains with greater potentialities; for studying the diseases and pests that infest the new plantations and developing means of controlling or eradicating them; for testing methods of propagation to insure the strongest, healthiest, best adapted, and longest-lived individuals for commercial plantations; for investigating cell structure and, with the aid of chemists, the chemical content of plants, when these may affect the final product or the means of obtaining it: and, first and last, for studying the kinds of plants, classifying and naming them, in order that the identity of those that are being grown commercially may be accurately known.

Botany has always figured in the foundation of a great many industries, for there are few products in the world, outside of the metals, which do not derive at least remotely from plants. With their present opportunities, North American botanists are entering a stage on which they are destined to play an important role in the development of industries based on plant production, particularly in the American tropics.

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Cover Photograph by courtesy of Bermuda Trade Development Association

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Southward to Quito in 1801

The Journey of Humboldt and Bonpland from the Mouth of the Magdalena, As Told in a Forthcoming Book, "South America Called Them"†

By Victor W. von Hagen

WHEN Sebastián de Belalcázar sacked Quito in 1534, he heard of the Lake of Guatavita, as did Quesada, and still yet another conquistador, Federmann. With their condottieri, (overwhelmed with that illness for which gold was the only specific) all three expeditions advanced upon the region of Lake Guatavita. The Chibchas were slaughtered without respite, and the Spanish conquest, splendid and incredible, settled down to the casual exploitation of the lands, and the Indians that survived the butchery were eclipsed in the "yoke of peace." Peace, yes, but a troubled peace! For the myth of the Lake of El Dorado galvanized the actions of men for centuries. From the charming folkway of the Chibchas, performed in a small Andean tarn, the fable of El Dorado grew and swept the whole of South America, luring men on in search of it.

Humboldt, himself, followed his own El Dorado—the dream of a passage around the world with Captain Baudin.* And for this South America may be grateful, for in Humboldt's search for a port in which to meet the illusive Captain Baudin and his vessels, he traveled far and wide in South America, and now in April, 1801, he and Bonpland stood on the shores of the río Magdalena.

The river ends in the marshy deltas of the Caribbean where whispering palm trees swish in the CHANDUY and sing the dirge of departed Chibchan glories. There the main channel is lost in a wide expanse, scrawled with

† To be published next summer by Alfred A. Knopf. Preprinted here by kind permission of both author and publisher. Further excerpts from the book will appear in later issues of this Journal.

* A letter from Humboldt to Baudin, written from Cartagena April 12, 1801, expressing the hope of meeting the captain in Lima, is quoted just above in this chapter of the book.

watercourses like a child's drawing board, the whole woven with jungles, lakes, morasses and meadows, patched with poisonous scum. Cattle wander there up to their distended bellies in water, feeding on blue water hyacinths. White ibises dot the mangroves, while egrets, blown by the Caribbean wind, make noiseless passage from island to island of tropical vegetation. Here, there are no trade winds to waft one up the river as on the Orinoco; from the very beginning one must secure polers to propel a vessel up the turgid tawny waters of the Magdalena.

Fortunately for the explorers, they joined with M. le Docteur de Rieux, an old French physician, who had been long enough in the Spanish colonies to grow immune to all the plagues and discomforts. With the Frenchman there were two Spaniards. They secured a BONGO, a large dugout extended on both sides by addition of boards and over this the traditional TOLDO or covering.

* * *

The days were all the same, each day repeated itself, a perfect counterpart for the day that had gone by. Like a fugue the river-passage was repeating itself; morning with the raucous call of parrots, the chatter of monkeys, the ghostly parade of white-plumed egrets, then breakfast on the river's edge, a few hours of plant-collecting, then noon as the bongo was pushed up the river, note-taking and anecdote-trading. In the late afternoon the rain fell in torrents; the evening was spent under mosquito nets which successfully held off the assault of myriads of insects. So up they went past the same villages, whatever their name, of Puerto Barrio or El Dorado, and at the end of fifty-five days of leisurely passage they came to rest at Honda. They had reached, so far as their bongo was concerned, the end of the river travel; henceforth the Magdalena broke up into cataracts and waterfalls like the Upper Orinoco.

At Honda they had only to display the King's seal to be given the best rooms in the King's way-house, erected and maintained for travelers. While the inn-keeper looked for sufficient horses and mules to carry their Excellencies 6,000 feet up into the Cordilleras, Bonpland collected while Humboldt finished his astronomical calculations. On their ascent of the Magdalena he had taken numerous geographical positions and angles, he had determined the velocity of the flow of the river, the temperature of the river and its various widths at geographical points; from all this data he was fashioning a map of the río Magdalena. Then in time the mules and horses were found, and, mounted as befitted gentlemen who carried the King's rubric, they climbed the sides of the Andes and so arrived, days later, at Bogotá.

Santa Fé de Bogotá had been a fabulous city. Founded on the gold, the accursed gold of the Americas, the gold which had galvanized so many undertakings, Bogotá had now, with the dispersal of the Chibchas, become

a small, easy-going colonial city. With the gold's disappearance the Santafernos were forced into stock raising and agriculture. But money was poured into their churches which raised them to presumptuous piles, with twisted baroque columns, fantastic façades that hung over—adorned with grape clusters and meaningless arabesques.

Yet Humboldt and Bonpland did not come to see the white towers of the Cathedral of Santa Fé de Bogotá; nor the massive-towered monasteries of Monserrat or Guadeloupe; nor the hundred-odd churches, all monuments to colonial piety, that ornamented the streets of the viceroyalty; nor did they come to see the strange dress of the Bogoteños, the ROANAS—the broad-brimmed hats, nor the women of Santa Fé dressed in their blue flannel petticoats and cloth mantles. They had, on the contrary, come to pay homage to a man—Dr. José Celestino Mutis, the celebrated botanist, the discoverer of nocturnal variation in the barometer, the co-author of a grammar of Colombian Indian languages—written to satisfy the regal request of Catherine of Russia to Charles III. Doctor, priest, teacher of natural science, director of the Expedición Botánica, metallurgist, and creator of a Colombian renaissance, Dr. Mutis was the last of the retinue of scientists that the late Carlos III had sent to the Americas. The fame of Mutis had leaped far beyond the borders of sky-scraping Bogotá. Humboldt had seen his plant collections in Madrid. The learned of Europe knew of Dr. Mutis through the accolade that Linnaeus had placed upon him . . . "*Nomen immortale, quod nulla aetas numquam delebit* . ." And to see this man of "immortal name," Humboldt and Bonpland had journeyed up the jungle-bound Magdalena.

Mutis, the great man, received them in his library which served also as an herbarium for 20,000 collected plants. Tall and heavy-set, majestic in figure, with dark piercing eyes, grey hair clubbed *à la catogan*, his face was endowed with a series of chins that cascaded down over his clerical bands. He was delighted to make the acquaintance of Humboldt and the *citoyen* Aimé Bonpland; their collecting and good works had already been brought to him by that mysterious bush-telegraph by which most things of the new world were learned. For their part, the explorers looked upon the most important figure of the many expeditions that had been sent out from Spain by Carlos III. Born at Cádiz in 1732, the year that the shape-of-the-earth controversy was raging in Paris, Mutis had in youth matriculated at the Universidad de Sevilla and later had taken his doctorate at Madrid. He had come to Bogotá in 1760 in the train of the Viceroy El Conde de la Zerda; had remained after the Viceroy's return to form the permanent Expedición Botánica in 1783. Mutis had inspired a great number of students—Zea, José de Caldas, Valenzuela, and Landet, to name but a few—and these men not only patiently collected in localized areas, and maintained a nursery of exotics, a *jardín de plantas,* but also studied medicinal plants such as quinine, ipecac, balsam, and huaco.

Mutis had been but one of the contingent of scientists that Carlos III had sent out to his far-flung colonial kingdoms. . . Among others the Spanish ruler dispatched Hipólito Ruiz and José Pavon with Joseph Dombey . . . (*"Galliarum regis Medico et botánico egregio."*) to Peru and Chile where they remained eleven years, suffering the tortures of Tantalus, while they collected and codified the riches of South America. They sent back their first two years of work in fifty-two cases, containing bird-skins, pressed plants, drawings and manuscripts, on the ship San Pedro de Alcántara, which never reached Spain, being wrecked at Peniche on a reef just within Portugal's territorial waters—and all the work of Ruiz, Pavon and Dombey was lost. Back again they went to collect more material. Then they were assailed by another catastrophe, a fire consumed not only three months of provisions, but most of the second collection as well. Once more they plunged into their work, and at last assembled, in seventy-three cases, another batch of 596 drawings, and this time returned with the material to Spain. These were the collections that Humboldt and Bonpland had viewed with utter amazement. None of this was ever published in its entirety, and Hipólito Ruiz they found sitting among the unpacked cases writing, as in a dream, his Introduction to a Flora of Peru. Only a portion of it was published in the next century.

Nor were these the only Spanish scientists that were neglected. . . José Celestino Mutis had fared better than all the others; he had not returned to Spain. Instead, with an enthusiastic group of students, he assaulted the green world of South America and remained in New Granada. Nor did their scientific work remain sterile with mere collecting; they developed botanical artists of superb talent. Humboldt looked through a collection of colored botanical plates, 6,000 in number, the finest he had ever seen. And in addition there were thirteen huge manuscript volumes of notes, all unpublished. Humboldt, aware of what happened to all that other splendid material rotting in Madrid, urged him that he publish.

Humboldt and Bonpland were lodged near his house in Bogotá and, as a gesture of friendship, he presented Humboldt with a hundred of his finest drawings. On their return to Europe, years later, Humboldt and Bonpland inserted in a section of their *Plantes Equinoctiales* an account of their journey to New Granada as well as a portrait of Mutis, containing the following inscription: "To Don José Celestino Mutis, director of the Royal Botanical Expedition to the New Kingdom of Granada, astronomer of Santa Fé de Bogotá, as a slight testimony of admiration and friendship. A. Humboldt and Aimé Bonpland."

* * *

In September, 1801, the expedition, now augmented by José de Caldas, made its way out of Bogotá to Quito. Down to the Cauca Valley, into Ibague, and then along the famed and ancient valley of Cauca to Popayan

and Almaguer they went. Then they climbed over the wind-swept páramo to Pasto, heaven-high in the hail-pelted Andes. The whole trip from there to Quito was filled with horrible experiences. Wind-swept days, shelterless nights, lack of food, and tight-rope walkers' experiences of negotiating twelve-inch paths with frowning abysses on both sides. There were days in which they had to rest until their feet recovered from attacks by the NIGUAS. At this point the usual good nature of Humboldt broke its bounds when he was offered a place on an Indian's back until his feet recovered. The mountain Indians, called CABALLITOS—little horses—were employed at a pittance to carry people on their backs over mountains which even mules could not negotiate. Humboldt refused outright, with no attempt at ceremony: "It really makes one's blood boil to hear the qualities of a human being described in the same terms as one would employ in speaking of a horse or mule."

They could now congratulate themselves for sending their fine and heavy instruments by sea, whilst they took the Andean trail. There was rain and yet more rain. High up, above 10,000 feet, the world was naked and sterile, and the air as cold as the glaciers of Switzerland. The last lap of the journey had been awful. "It would hardly be possible," Humboldt remembered, "to picture a more horrible road. Here we spent Christmas, 1801, and although they had nothing, we were welcomed by the inhabitants with touching hospitality."

Beyond this high páramo they passed from the Kingdom of New Granada into the Audiencia de Quito. Almost at once they were met by smiling skies and fertile valleys. This was sacred scientific ground. La Condamine had worked here.

They reached Quito in January, 1802.

Bermuda—Its Gardens and Scenery

With a Note on the Islands' Native Plant Life

As Presented in a Lecture at the Botanical Garden

By Fred J. Seaver

BECAUSE of its isolation, mild climate, and quiet atmosphere, Bermuda, before the war, had come to be looked upon as the winter playground of the nation, especially for persons living in eastern United States and Canada, and this mid-ocean paradise has often been referred to under the alluring title "the isles of rest." In normal times, so many thousands of Americans have availed themselves of these advantages during the winter season that the thirty thousand residents have come to rely largely on the tourist trade for the maintenance of their beautiful surroundings.

As a result of the present war, however, this trade has been temporarily eliminated. This might have worked hardship on the residents were it not that the place has been practically taken over for war work. In addition to the American air and naval base which occupies a large part of the eastern end of the islands, it is also a base for the censorship of the European-American mails. These activities have taxed the living facilities to their limits, and have compensated economically for the loss of the tourist trade. No doubt the war will also stimulate a renewed interest in agriculture, which was the islands' chief industry in early times and until the residents found it more profitable to cultivate the tourists than the soil.

Though agriculture has declined greatly since that time, it still holds an important place in the activities of the islands. Some of the leading crops are potatoes, onions, and Bermuda lilies. Bananas and papaws are also grown for home use. Citrus fruits can be grown but their culture has not proved profitable. Frost is practically unknown, and because of the favorable climate four crops of potatoes can be grown successfully in one season. Most of the ordinary vegetables grown on the North American continent can also be produced there, besides many others which are semi-tropical. While the soil is thin on the average, in the ravines and depressions it is deep and fertile. It consists of weathered limestone, inter-mixed with organic matter, and has a decidedly reddish color. Seaweeds which drift in to shore in great quantities are used as fertilizer.

Bermuda has always been noted for its beautiful gardens. During the winter season the poinsettia and bougainvillaea are in their glory, while in the spring the Bermuda lily and oleander hold the center of the stage. Altogether Bermuda is the most colorful place the writer has ever seen. The islands are composed of limestone from which are cut building blocks for the houses. The old quarries are then converted into quarry gardens, a unique feature of the place.

Mark Twain, who used to spend his winters there, once remarked: "Bermuda is just the right place for a jaded man to loaf in." Woodrow Wilson spent a winter vacation there after his election and before his inauguration to the Presidency, returning on the old steamship "Bermudian" —probably never dreaming that this very ship was later to be used to transport American soldiers to Europe in the first world war.

But not all those who go there have either the intention or the disposition to rest or loaf. Tom Moore, the Irish poet, wrote some of his finest poems while in those islands. Mark Twain both loafed and wrote. Eugene O'Neill has prepared some of his finest works there, and many other outstanding writers might be mentioned. William Beebe has made it a laboratory for the study of deep sea life, both animal and plant.

The native land plants are of extreme interest to scientists. Since the islands have been built up in mid-ocean by natural agencies, all the land plants found there, when they were discovered by the Spaniards about 1503,

must have been brought in from the outside world entirely without the aid of man. The New York Botanical Garden has taken the lead in surveying and publishing descriptive lists of the plants of Bermuda. In making this survey, Dr. Britton* noted that 8.7% of the plants found on the islands were endemic—that is, not known to occur naturally in any other place in the world. We can only assume that these have been derived from pre-existing forms grown under extreme conditions of isolation. It is this which adds interest to the study of the plant life there. Two of the outstanding endemic species are the palmetto, *Sabal bermudiana,* and the Bermuda cedar, *Juniperus bermudiana.* The cedar is the predominant tree of the islands. While it appears dwarfed and stunted on exposed areas, it attains a trunk diameter of three or four feet or, rarely, more in protected areas. Both of these endemics have suffered much at the hands of man, and at the present time only a few pure stands of the palmetto have been preserved.

My own interest in Bermuda dates from 1912 when asked to accompany Dr. N. L. Britton, who was at that time preparing his studies of the flora of Bermuda for publication. Although the higher plants were quite well known at that time, some of the lower forms, especially the fungi, with the exception of the lichens, were almost a closed book, scarcely more than a score of species being known. As a result of this visit, the first extensive list of Bermuda fungi was published in the Memoirs of the New York Botanical Garden in 1916.

This first visit to this miniature fairyland aroused an interest which has persisted up to the present time. Three visits have been made since then, the latest in 1940, and a fourth is planned for as soon as the islands are opened again to tourists—including those bent on scientific study.

As a result of my last two visits, technically vacation trips of two weeks each, more than a score of new species of fungi have been described in collaboration with Mr. J. M. Waterston, Plant Pathologist of the Bermuda

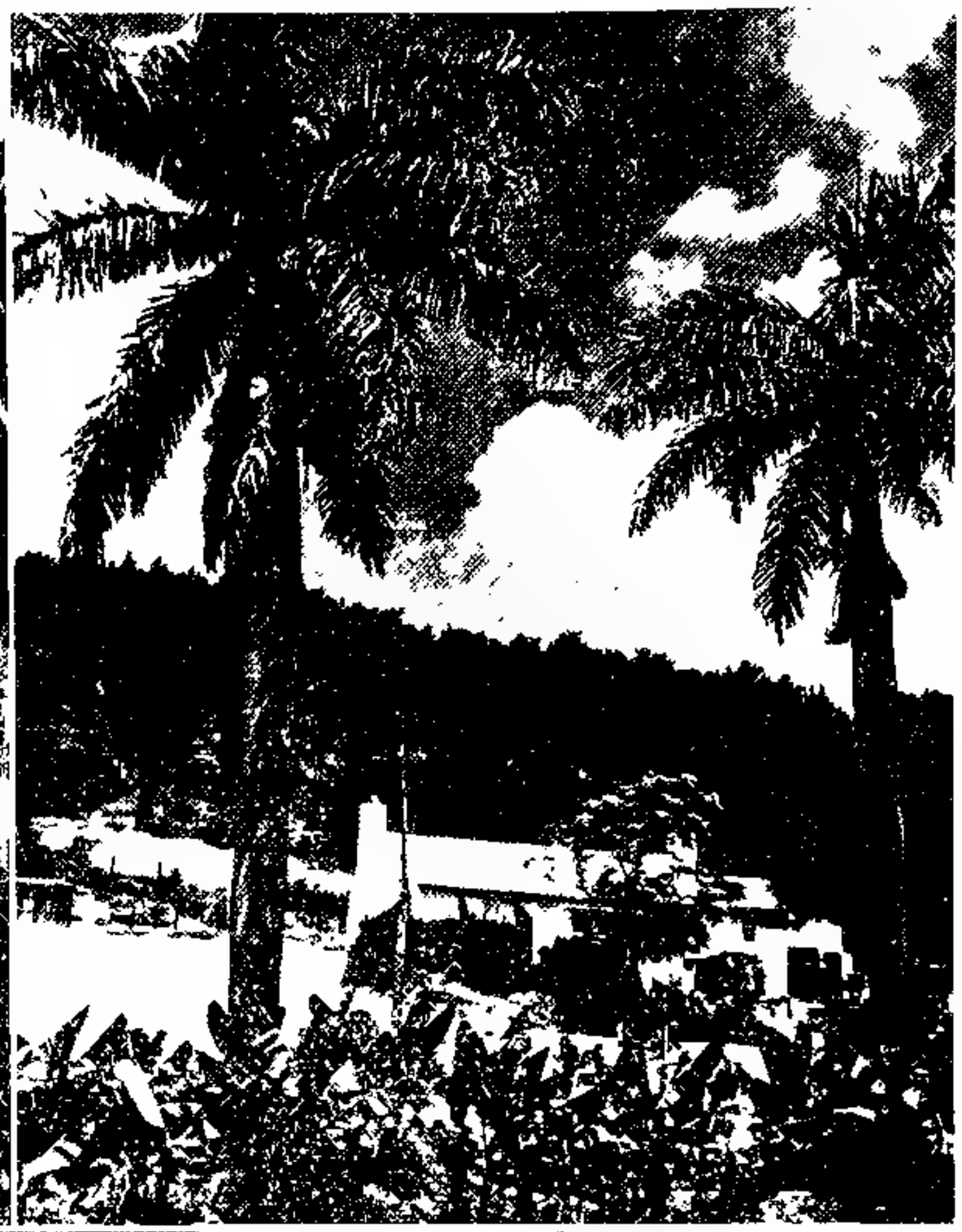
"THE RIGHT PLACE FOR A JADED MAN TO LOAF IN"

On the opposite page are some scenes from Bermuda gardens, with the native cedar evidently shown in the upper and middle pictures and the endemic palmetto of Bermuda above at the right. Easter lilies are blooming outside a Bermuda cottage on page 6, while on page 10 are three additional scenes of Bermuda homes and their surroundings, with a night-blooming cereus climbing over the gate above at the left, royal palms shown in the other photographs, and two papayas beside the house at the bottom of the page.

* * *

(The illustrations used are reproduced by courtesy of the Bermuda Trade Development Company.)

* Britton, Nathaniel Lord, The Flora of Bermuda. 1918. Privately published. For sale by The New York Botanical Garden.



Agricultural Experiment Station. In addition to these, a number of very rare species have been found. The results of this work are being recorded in a series of technical papers published in *Mycologia*. When the war is over, it is hoped that this work can be resumed.

Taro, Ancient Food Plant Of Tropical Regions

By Willard M. Porterfield, Jr.

(No. 13 of a series of articles on Chinese Vegetable Foods in New York)

ONE OF THE OLDEST cultivated plants in the world is the taro, which has been grown as a staple food crop in tropical countries for so many centuries that today no one knows where it originated. There is no place in the world where it is now found growing wild.

China is one of the many countries where taro has long been raised for food, and in normal times the Chinese in New York can get the familiar tubers in their Chinatown markets. Americans very occasionally buy them there too, probably chiefly as a reminiscence of former days spent living in tropical countries where they found them an acceptable substitute for potatoes.

The taro belongs to a group of plants referred to as Aroids, comprising the family Araceae, of which the jack-in-the-pulpit and calla-lily also are members. The species usually grown, especially around the Pacific, is *Colocasia esculentum*. A variety of this, with smooth rather than hairy tubers, is cultivated in Florida under the popular name of "dasheen." In Egypt, where the use of taro as a vegetable evidently dates back to antiquity, the species grown is *C. antiquorum*. (*C. esculenta* has by some been called a variety of this.)

Both of these plants are also grown in subtropical, even in temperate, climates under the name of elephant's-ear for the ornamental effect of their large, wavy-edged, arrow-shaped leaves, which spring directly from the top of the fleshy tuberous rhizome. The leaf-stalks sometimes grow to eight feet in height.

The best photographs of taro plants, their tubers and flowers, are to be found in Bulletin 1247 of the United States Department of Agriculture.[1] In general, they are stemless, succulent herbs consisting of four or five leaf-stalks rising from a vertical tuberous rhizome and bearing large cordate peltate leaves. The tubers are the part of the plant most used for food, though the leaf-stalks and the young leaves are also eaten. The exterior of the tuber, which is ovoid or obovoid in shape, is somewhat hairy and at short intervals is encircled with rings, with here and there an eye or bud between the rings. A ring is formed by the dropping off of a leaf base. The flesh of the tuber is like that of a potato only of a more cheesy consistency, and in color is white, creamy, or tinged with yellow, rose, or purple. In the Chinese food shops two kinds of tubers appear:

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[1] Young, Robert A. Taros and yautias: Promising new food plants for the South. U. S. D. A. Dep't Bull. 1247: 1-23. 1924.

large ones which support the main plant and small ones which grow out as lateral appendages of the former.

Taro plants have qualities that enhance their value over many other crops in tropical agriculture. They are adapted to soils which are too wet for other root crops such as sweet potatoes. They grow rapidly under optimum conditions of soil and moisture. They produce two to four times the average yield of potatoes. Their preserving qualities whether in the ground or dry in bags are excellent. They are resistant to insect and fungous pests. Besides being used for food, the tubers are used for stock feed, starch, and for the manufacture of meal and alcohol, for which their small starch grains are favorable.

The cultivation of taro in tropical and subtropical regions is world-wide, and a hundred or more varieties have been developed. Liberia and Egypt, Palestine and Syria, India, Java, New Zealand, Polynesia, the Philippine Islands, China, Japan, Hawaii, Cuba, and Puerto Rico have raised taro crops since the dawn of history. As to the region where cultivation first began, there is no uniformity of opinion. Cook [2] claims on the basis of the fact that it goes by the name MALANGA in Puerto Rico and Cuba, which is akin to the east African name MALOMBO, that taro was introduced into the West Indies from Africa through the slave trade. Higgins,[3] on the other hand, claims it is a native of India and from there spread to Malay, Sumatra, and the Polynesian archipelago.

The scientific name of the genus *Colocasia* is said to be related to the ancient Egyptian word for the plant—CULCAS or QOLQAS. Though doubted in some quarters that the cultivation of taro is so old in Egypt, it has nevertheless been found that the word CULCAS is still used among the Arabs to designate the taro plant. The Latin names by which this plant has been called are numerous.[4]

In China the cultivation of taro was spoken of by authors before the Han dynasty, but it is not included in the ancient classics. Only in the dictionary Shuo-wen[5] written about 100 A. D. by Sü Shen is it described. It was also mentioned in the Ming-i-pie-lu,[6] an ancient Chinese work on *materia medica* in which the seeds and leaves were noted as having medi-

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[2] Cook. O. F. Agricultural history and utility of the cultivated Aroids. U. S. D. A., B. P. I. Bull. 164: 31-37. 1910.

[3] Higgins, J. E. in L. H. Bailey, Cyclopedia of America Agriculture **2**: 629-631. 1907.

[4] Linnaeus (Species Plantarum **2**: 965. 1753) cites two forms— *Arum esculentum*, which he says is American, and *Arum Colocasia* which is cultivated in Egypt and Syria. These are judged by Schott (in Schott & Endlicher, Meletemata Botanica 18. 1932), voluminous writer on Aroids, to be the same plant which he has named *Colocasia antiquorum*. Other synonyms are *C. indica*, Kth., *Arum indicum*, L., *A. chinense* Lagerst., *Caladium acre* R. Br.

[5] Bretschneider, E. On the study and value of Chinese botanical works with notes on the history of plants and geographical botany from Chinese sources 12. Foochow. 1870.

[6] Bretschneider, E. Botanicum sinicum **3**: 414-415. No. 261. 1895.

Tubers of taro from the markets of Chinatown. Above, the smaller ones which occur as offshoots from a main tuber, represented below. All are shown one-third natural size. Buds can be seen at the nodes, directly above the rings which are made by the leaf-scars on each tuber.

cinal value. Of the early explorers in the East, not one seems to have mentioned or collected the taro. Magnus von Lagerstroem, a Swedish naturalist, in an account written in 1754,[7] is said to have introduced at Upsala a plant which he called *Arum chinense*, undoubtedly meant to be the taro. For this name I find no other authority than his, and it is not mentioned in the Index Kewensis. It is strange that of all the students and collectors of Chinese plants listed and described by Bretschneider, the account here cited is the only one mentioning this useful plant. Although it does not occur in the wild, Bentham [8] listed it among his Honkong plants, remarking at the same time that it was not improbable that the specimen sent him was an escape from cultivation. Henry [9] reported the common cultivation of taro, YU-T'OU, through middle and south China along with the related Aroids *Alocasia odora* and *Alocasia cucullata*. Wilson [10] from west China recounted the extensive cultivation of the taro and the variety "Kiang-tou" which has purple-colored tubers. In 1916 investigations by the United States Department of Agriculture [11] yielded data and photographs of taro culture in Shensi and Chekiang provinces.

B. W. Skvortzow [12] in 1920 described the taro plantations around Foochow in China. They are seen mostly among the rice paddies around the villages, on the edge of dykes, small canals, and streams. The procedure of planting is as follows:

> After the soil is well fertilized, the small taro roots are planted in rows about 70 centimeters (27 inches) wide, the plants being about 50-70 centimeters apart. According to the lunar calendar they are planted in the third and fourth months and are harvested in the tenth, eleventh, and twelfth months. During the summer, the plants are built up, so that by the time of harvest the rows of earth are 20-25 centimeters (8-10 inches) in height Each tuber planted in the spring yields in autumn several roots, one or two of which are large in size.

The four varieties known at Foochow are: (1) the white round or autumn taro, a large variety sometimes reaching the size of a coconut; (2) the brown taro, also a large variety but elongated and covered with brown hair-like fiber, (3) the red or winter taro, small, oval with rose-colored skin; and (4) a taro with fiber like that of the coir palm (*Trachycarpus excelsus*), small and dark brown in color. All of these varieties have white flesh but differ in size, shape, external color and covering, differ also in the color of "strings" running through the flesh, and in taste.

In Japan,[13] where the name is TO-NO-IMO, I have seen it growing in fields constructed very similar to rice paddies.

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[7] Linnaeus, C. Amoenitates Academicae **4**: 234.
[8] Bentham, G. Flora Hongkongensis 343 (Colocasia indica Kth.). 1861.
[9] Henry, Aug. Notes on economic botany of China 35. 1893.
[10] Wilson, E. H. A naturalist in western China **2**: 59. 1913.
[11] Plant Immigrants (U.S.D.A., B.P.I.) No. 118. pp. 968 and 1292. 1916.
[12] Skvortzow, B. W. Notes on the agriculture, botany, and the zoology of China. Journ. N. Chin. Br. Roy. As. Soc. **51**: 138. 1920.
[13] Tanaka, Y. Useful plants of Japan. Agric. Soc. of Jap. pp. 17 and 26. 1895.

In Hawaii, where approximately 45 varieties are recognized, the lowland types of the plant are more used than the upland types because they are less acrid and sweeter tasting. These mature in from 13 to 15 months [14] depending on the variety. The tubers are harvested and used not only for eating but also for the manufacture of POI. To make poi, the tuber is first steamed or boiled, then the skin is removed. On long boat-shaped taro-boards, it is then pounded with stones. When water is added, the meal forms either a thin paste of "two-fingered" consistency or a thick paste of only "one-fingered" consistency. It is allowed to stand one or two days while it ferments, after which it is ready for use. In addition to poi, the taro tuber appears in other forms for eating. It may be steamed, boiled, or baked in the manner of a potato and is considered a good substitute for it. It is also preserved in salt or dried for future use. The plant is adjudged suitable for cultivation in the southern part of the United States.

A small tuber weighing from 60 to 70 grams contains in its original state 74.2% water,[15] 1.7% protein, .27% fats, 17.9% starch and 1.1% cane sugar, while a large tuber weighing from 500 to 800 grams in its natural state contains 67.5% water, 1.9% protein, .16% fats, 25.3% starch, and 1.8% cane sugar. In both, the albuminoid content is 1.6% and the ash a little over 1%.

Certain medicinal virtues are ascribed to the taro. In the Botanicum Sinicum [16] seeds and leaves were mentioned as officinal, the seeds being slightly poisonous. Stuart [17] says the seeds are recommended "in indigestion, flatulence and in disorders of parturient women." A decoction of seeds, leaves, or stalks may be used as an application in insect bites and other poisons.

However, most varieties seldom or never produce flowers and none of the cultivated forms have been observed to produce seed.[18] They are grown for their tubers and are propagated vegetatively, hence seed production is of no importance in their culture. Those which do flower develop at the axil of the leaf a cluster that opens, one flower at a time. Much of the time the flower bud never opens. The florets on the spadix absciss almost immediately and the whole structure undergoes deterioration very quickly. The flowers of related species are snail-pollinated, but no snails have been observed on taro. The few wild species of the genus occasionally produce seed, but it is thought that these are insect-pollinated. The spathe has a distinctly unpleasant odor.

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[14] Bailey, L. H. Cyclopedia of America Agriculture **2**: 629-631. 1907.

[15] Blasdale, Walter C. A Description of some Chinese vegetable food materials. U.S.D.A., O.E.S., Bull. 68: 13. 1899.

[16] Bretschneider E. Botanicum sinicum, part 3: 414-415. 1895.

[17] Stuart, G. A. Chinese materia medica 123. Shanghai, 1928.

[18] Barrett, O. W. Promising root crops for the South. U.S.D.A., B.P.I. Bull. 164: 1-29. 1910.

A further word should be said in regard to the sterility[19] of this species already referred to above. The explanation of this sterility is found in the facts that first we have dichogamy and second the anthesis of the "flower" is incomplete. The spadix is straight, the extreme tip being sterile. The pistillate flowers clustered around the base mature first, after which the enclosing tube of the spathe partly unrolls so that snails and small insects which might bear pollen may enter. The tube then closes, but the spathe opens to expose the staminate flowers. The pollen is shed but with few exceptions none of the pistillate flowers are exposed sufficiently for pollination to take place. According to Mr. Young, some varieties of *Colocasia esculenta* flower only at rare intervals, while others seem entirely to have lost the flowering habit. Some varieties are said to flower freely but there is no record of taros having set any seed except in Hawaii. Hand-pollinations were tried in Florida but without success.

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Jan. 27 ***Your Soil, How to Manure and Maneuver It***
Lecturer: *T. H. Everett*

Feb. 3 ***What to do in Spring*** **(April and May)**
Lecturer: *James B. Jack*

Feb. 10 ***What to do in Summer*** **(June, July, and August)**
Lecturer: *E. T. Lloyd*

Feb. 17 ***What to do in Fall*** **(September and October)**
Lecturer: *Thomas Little*

Feb. 24 ***Fruits for the Home Garden*** **(Tree Fruits)**
Lecturer: *Arthur King*

Mar. 2 ***Fruits for the Home Garden*** **(Bush Fruits and Berries)**
Lecturer: *Edwin Beckett*

[19] Young, Robert A. loc. cit. (See note 1 above.)

WINTER LECTURES AT THE GARDEN

SATURDAYS AT 3 P.M.

Jan. 8 ***Scenes Through the Year at the Garden***
A Motion Picture in Natural Color

Jan. 15 ***Food Plants and Ornamentals—***
Their Origin and Improvement
A. B. Stout, Curator of Education and Laboratories

Jan. 22 ***Insect-Eaters—***
Close-up Color Photos of Carnivorous Plants
Rutherford Platt

Jan. 29 ***Gardens of Antiquity***
H. W. Rickett, Bibliographer

Feb. 5 ***Bermuda's Flowers and Scenery –***
In Natural Color
F. J. Seaver, Head Curator

Feb. 12 ***What Plants Mean to the World***
William J. Robbins, Director

Feb. 19 ***Wild Flower Trails—***
A Motion Picture in Color, with Lapse-Time Photos of Plant Growth
Walter E. Thwing

Feb. 26 ***Hawaiian Plants and Ancient Island Customs***
Otto Degener, Collaborator in Hawaiian Botany

Mar. 4 ***First Steps for the Vegetable Gardener***
T. H. Everett, Horticulturist

Mar. 11 ***Shrubs for Attracting Birds to the Garden***
Carl W. Buchheister, National Audubon Society

RADIO PROGRAMS

FOR JANUARY AND FEBRUARY

Alternate Fridays, 3:30 P.M., WNYC (830 on the dial)

Jan. 14 ***Cacti, Coffee, and Cumquats—***
A Winter Tour of the Main Conservatories
Mrs. Robert H. Fife, Chairman of the Advisory Council

Jan. 28 ***Begonias in a Suburban Sunroom—***
Confessions of an Amateur Grower
S. P. Miller, Scarsdale, N. Y.

Feb. 11 ***Bringing Rubber Back to the Americas***
Charles Morrow Wilson, Author of "Trees and Test Tubes"

Feb. 25 ***Raising Flowering Plants from Seed in Wartime***
Alfred Bates, Newark, N. J.

Notices and Reviews of Recent Books

(All publications mentioned here may be consulted in the Library of The New York Botanical Garden or may be purchased on order through the Library.)

The Fairchilds' Cheng-Ho Cruise

GARDEN ISLANDS OF THE GREAT EAST. David Fairchild. 239 pages, illustrated with 124 photographs, indexed. Charles Scribner's Sons, New York, 1943. $3.75.

Every reader of "Exploring for Plants" and "The World Was My Garden" will be eager to read Dr. David Fairchild's new book. Every garden lover, particularly of warm and tropical regions, will be interested to learn how Dr. Fairchild spent five months, beginning in January 1940, in "collecting seeds from the Philippines and Netherlands India" while guest of Mrs. Anne Archbold on her palatial junk-yacht, the *Cheng-Ho.* Accompanied by Mrs. Fairchild on a Danish freighter stopping at Yokohama, Kobe, Shanghai, and Hong Kong before reaching Manila to join the *Cheng-Ho,* Dr. Fairchild had the opportunity to tarry several months in regions now closed to us until we have brought to time the war lords who "by lying threats, those tools of war, have roused an almost paranoic beast within the human animal." Everyone interested in the Orient will be pleased by Dr. Fairchild's sane attitude toward the highly talented teeming millions of the "Great East."

The junk-yacht on which the Fairchilds sailed and on which the reviewer cruised about Fiji in 1940, also as guest of Mrs. Archbold, is absolutely unique.* She had been launched in Hong Kong, with Chinese priests in their heavy, red brocade robes conducting appropriate ceremonies. Even Tien Fei, the protecting saint of the cruise, had her shrine in the dining room to the great delight of the Chinese crew, and perhaps (who knows?) would bless the *Cheng-Ho's* two scientific cruises if she were properly honored as is her due. The python was said to be sacred to her; so the flag of the junk showed that emblem.

During the *Cheng-Ho's* cruise from the Philippines south to Celebes and Java, and then northeast to Amboina, Batjan and back again to the Philippines, seeds of many curious and strikingly ornamental plants were collected, and many fascinating regions visited. However, "Calamity Sunday" arrived on February 25, 1940, the day after a python, sacred to the goddess Tien Fei, was killed. The reader can satisfy his own curiosity regarding this event. This bad luck seems to have attached itself like a barnacle to the boat. But the remarkable vessel escaped the Pearl Harbor fiasco and is apparently still in existence. Perhaps Tien Fei, may her soul rest in peace, felt that members of the two scientific expeditions had finally atoned for the death of the python. If you doubt this, ask any Chinese member of her crew.

The purpose of the Fairchild Garden Expedition of the *Cheng-Ho,* in Dr. Fairchild's words, "was primarily for the collection of *living* plant material—seeds, cuttings, rooted plants, tubers, etc.; in short, any plant which would reproduce the desired species in our slathouses." The plants collected were shipped post haste—and that means mainly by clipper mail—to Florida to be grown there for acclimatization and ultimate distribution elsewhere by the Fairchild Tropical Garden Association, of which Dr. E. D. Merrill is president. Many of the palm species collected are especially gorgeous, as the excellent photos show.

In spite of Tien Fei's curse and the curtailment of the cruise because of war conditions, the expedition, by the sacrifice of personal comfort on a vessel that could hardly have smelled like a bed of violets with maturing durian and other "cheesy" fruits aboard, became eminently successful. Its botanical "loot" numbered more than 500 different kinds of plants. The gardens of Florida and eventually throughout the world will be materially improved and beautified by the industry and vision of the Fairchilds and

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* See September 1943 issue of Journal for photos and further details.

of Mrs. Archbold who, with the *Cheng-Ho,* made that vision a reality. To the reviewer no criticism of the book comes to mind except for two minor errors in plant names occurring on pages 139 and 230. These should be corrected before another edition goes to press. As a critic of the cruise, however, he feels that the expedition could so easily have doubled its scientific value had herbarium specimens been collected at the same time and as eagerly as seeds and other propagules. This lack will always be a regret to the botanist.

OTTO DEGENER,
Member of the last cruise of the
Cheng-Ho.

Orientation in American Agriculture

THE AMERICAN LAND—Its History and its Uses. William R. Van Dersal. 215 pages, illustrated, indexed. Oxford University Press, New York, 1943. $3.75.

This is a book to help the student of American agriculture to get his bearings. Every phase of agricultural production is mentioned from early beginnings in the forest primeval to the wastage of present-day man-made erosion. Every crop of any importance in American agriculture is discussed. These range from vegetables on the Eastern Seaboard to nuts in California, and from tropical fruits of the South to wheat and rye in the North. Obviously, any discussion of so many different subjects must, of necessity, be brief to be contained within the confines of 205 pages. This is no technical treatise on the culture of the various crops; there are no factors to be considered and no study on the job analysis basis. Rather, the book is written in popular style, and, in some ways, has the fascination of a historical novel.

One of the most interesting discussions is of the corn plant, probably because of the mystery of its origin. The author says, "There were many tribal legends and ceremonies clustered about the plant, but no one of these offers the slightest clue to the origin of the grain."

Innumerable interesting facts are given about each crop; for example: "Wheat came wholly from the Old World; corn came wholly from the New; but cotton came from both." Enough is said of the culture of each type of plant to give even the novice an idea of how it is grown, and some of the problems of weed, insect and disease control that are involved.

Scattered throughout the book are 64 photographic plates, comprising 122 different pictures, illustrating the text. These are no ordinary pictures, but show excellent photographic work with an eye to beauty, as well as being illustrative.

One cannot read the chapter on "Forests and Woodlands" without gaining a new respect for this phase of our national wealth and an increasing abhorrence of a forest fire, while a mere glimpse of the chapter on "Wild Life and Recreation" stimulates a firm resolve to pack the car for a trip in almost any direction—a resolve which momentarily is held in check as present problems of winning the war assume precedence.

The closing chapter shows something of the wastage and exploitation of the land during the past 300 years of development, and then, by contrast, the new pattern of conservation methods brightens the hope for the future. American Agriculture is having its face lifted. It is still the foundation of our American Democracy.

HOMER B. NEVILLE, *Instructor,*
State Institute of Agriculture,
Farmingdale, New York.

Consultive and Text Book For Flower Growers

FLORICULTURE — Fundamentals and Practices. Alex Laurie and Victor H. Ries. 496 pages, indexed. McGraw-Hill Book Co., Inc., New York, 1942. $4.

Primarily a textbook, this work nevertheless is a valuable consultive medium, both for the student of ornamental horticulture and the expert-practical gardener, because it answers many a problem with all the accuracy that scientific study to date has made possible. As the authors explain, numerous books have been written about individual plants or groups of plants, many of them by laymen who have largely depended upon their own experiences for their store of information. It could be added that many more such

books have been written by individuals who, lacking essential knowledge, have largely depended upon what they have read and thereby may have perpetuated erroneous suppositions.

The work under notice is admittedly an attempt to bring together in accurate form the basic information underlying many empirical practices and, at the same time, present all reliable data to meet the needs of those who seek cultural information in compact form. In other words, the authors have added to their own knowledge, gained by practical and experimental work at Ohio State University, a digest of innumerable works they have consulted. The result is a book which is tremendously wide in scope, the information therein being so comprehensive that, to find its equal, one would need to peruse much literature, scientific and practical.

In no other general gardening book will one find so enlightening a discussion of "How Plants Grow." Science has made great progress in the understanding of growth, and here, in a score or so pages, is compressed the most up-to-date knowledge available. In much the same way the authors cover the subjects of soils and fertilizers, combining the scientific and the practical. The student who can memorize and use all the data given on horticultural taxonomy is well on the way to being a capable botanist.

On the subject of soilless culture, Prof. Laurie is especially well posted, as at Ohio State University this system has been studied over a period of years, the findings having been adapted to no small degree in the commercial field.

Proof that this volume merits the title it bears is indicated by some of its chapter headings: Cold Frames, Hotbeds and Greenhouses, Garden Design, Propagation of Plants, Lawns, Annuals, Perennials, Flowering Bulbs, Rock Garden, Roses, Water Gardens, Woody Plants, House Plants, Insect Pests and Plant Diseases, and Greenhouse Management. Every chapter presents practical information, and not the least important features are the lists of plants which are discussed under their respective family headings with sufficient cultural information to be of real service.

T. A. WESTON,
Associate Editor,
The Florists' Exchange.

Encyclopedic Volume on Overcoming Ailments Of Ornamentals

DISEASES AND PESTS OF ORNAMENTAL PLANTS. Bernard O Dodge & Harold W. Rickett. 638 pages, illustrated, indexed. The Jaques Cattell Press, Lancaster, Pa., 1943. $6.50.

This book has the immediate distinction of attempting for the first time in an English, or at any rate an American, handbook the subject of disease and pest control in relation to ornamental plants as a whole. It has, therefore, an exceptionally broad aim and should be judged primarily on its success in attaining its large objective rather than on its merits or deficiencies in some portion of this field. Let us first see how it fulfills this aim.

In the first four chapters it presents a general outline of the causes, the effects, and the means of preventing or overcoming plant diseases, using the latter term in the sense of any ailment however induced. Brief descriptions are given of the principal kinds of parasitic fungi and of insect pests affecting plants. This is standard material but the examples are chosen from the disease and pest problems that are most commonly met in ornamental plant culture. The chapter on control methods is comprehensive and reasonably up-to-date; it provides a convenient reference center for a variety of information useful in combatting plant enemies. The greater part of the book (500 pages) is devoted to a descriptive list of diseases and pests arranged in alphabetic order of hosts, including herbaceous garden and greenhouse plants, shrubs, and trees. This section is of real encyclopedic value, since the diversity of subjects comprising the ornamental plant field is exceeded only by that of the sources whence emanates the information pertaining to them.

On the whole the book fairly meets the test proposed in paragraph 1—the information assembled here probably exceeds in scope and selectivity any comparable material relating to this group of plants that can be found outside a very few institutional card catalogs. Whether the average gardener, or even the commercial grower of ornamentals, will profit more from an encyclopedic treatment of plant pest problems, or from a selection of special treatises in the form of govern-

ment bulletins and a few existing manuals, notably on trees, can be determined only by a series of comparisons. At any rate, one may now choose either course or take both.

In a number of specific instances the information given is incomplete, selected without sufficient discrimination, or sometimes inaccurate. Attention has been called to some of these in other reviews (*Science* 98: 474-476. 1943, and *Phytopathology*, in press), and still others remain. Probably only the co-ordinated information of a group of pathologists and entomologists specializing on ornamental plants would be adequate at present to produce a comprehensive handbook substantially free from such defects. The present authors have dealt with their subject as competently as any one or two individuals could.

FREEMAN WEISS
U. S. Bureau of Plant Industry, Washington, D. C.

Gay Garden

GARDEN FLOWERS IN COLOR. Daniel J. Foley 319 pages, illustrated, indexed. Macmillan, New York, 1943 $1.98.

Color work has greatly improved since the earlier issues of the series of books on garden subjects in color. In this newest volume, the 350 plants are alphabetically arranged according to the name by which they are most frequently known, whether it be the common or the scientific name. There is at least one illustration in color on every page, accompanied by a few paragraphs to aid in the cultivation of the plant. Besides annuals, perennials, shrubs, and a few bulbs, some plants which are ornamental for their leaves or fruits are shown.

CAROL H. WOODWARD.

Up-to-Date Text on Cell Study

FUNDAMENTALS OF CYTOLOGY. Lester W. Sharp. 270 pages, illustrations, bibliography, index. McGraw-Hill, New York, 1943, $3.

In the words of the author's preface this new volume is a "textbook" which, in comparison with his larger volume of the 3rd edition of "Introduction to Cytology" published in 1934, is "briefer, simpler in treatment, and, it is hoped better adapted to the needs of students." The subject matter is assembled under seventeen main topics or chapters which very adequately and authoritatively cover the scope of cytology and present the fundamentals of its application to genetics and phylogenetics. Of the works on cytology cited for reading, about 250 in number, approximately four out of five have been published since 1934. The consideration and evaluation of these recent advances in knowledge are reflected throughout the pages of the text. This makes the volume of special value to teachers and to the more advanced students and workers in cytology as well as to those who may need a textbook.

A. B. STOUT.

Vegetable Culture

VICTORY GARDEN MANUAL. James H. Burdett. 128 pages, illustrated. Ziff-Davis Publishing Co., New York, 1943. $1.75.

A book about vegetables by the Director of the National Garden Bureau, an organization maintained by the American Seed Trade Association.

Written for the home gardener in a chatty style and in a phraseology which the beginner can grasp, it contains sound advice and is furnished with attractive illustrations, many of them from natural color photographs.

EDWIN BECKETT.

New Facet on Carver's Life

GEORGE WASHINGTON CARVER —God's Ebony Scientist. Basil Miller. 166 pages. Zondervan Publishing House, Grand Rapids, 1943. $1.50.

Basil Miller's book on Dr. Carver is pedestrian, but it contains fresh material that is interesting. He gives us a description of the controversy between Booker T. Washington, the founder of Tuskegee, the practical man of action, and George Carver, Tuskegee's most eminent teacher and scientist, the man of thought. It was a controversy over egg production. Dr. Carver was much more interested in experimenting with various methods of preserving and cooking sweet potatoes than in making the ducks and hens of Tuskegee pay for their keep. This problem was finally solved by creating a department of agricultural research with

Dr. Carver in entire charge. This laboratory became his throne, from which his influence touched all corners of American life.

A third biography of Dr. Carver is to appear next spring. He is at last receiving the recognition deserved for a life lived in the service of humanity and science.

AMY SPINGARN.

Murder Without Mystery

INSECT INVADERS. Anthony Standen. 228 pages, illustrated, indexed. Houghton-Mifflin, Boston, 1943. $3.50.

Someone has called this book about insects the horror story of the year. It is a good tale, fraught with intrigue, hate, suspense, and climax—as well as supplied with scientific facts, supplemented by excellent illustrations which help us to understand these creatures which are sometimes beneficial, sometimes baneful.

CAROL H. WOODWARD.

Gardening in the West

SUNSET'S VEGETABLE GARDEN BOOK. Editorial Staff of Sunset Magazine. 71 pages, illustrated, indexed. Lane Publishing Co., San Francisco, 1943. $1.

First glance through this book did not make the most favorable impression, but complete reading of it brought out many good points.

The instruction given is sound and the subject is well arranged. Though primarily published for the benefit of growers in the western states, it may be easily adapted for other locations. It is a good book for the beginner.

EDWIN BECKETT.

Summer Bloom

THE BOOK OF ANNUALS. Alfred C. Hottes. 172 pages, illustrations, tabular list of annuals, index. De La Mare, New York, 1942. $1.50.

An easy guide to an abundance of bloom in the garden all summer long. Now appearing in its fifth edition in twenty years.

CAROL H. WOODWARD.

Notes, News, and Comment

Anderson Fund. The balance of the fund of $25,000 promised to the New York Botanical Garden in 1936 by the late Alexander P. Anderson, was received from his estate on December 16. The original fund, which amounted to $10,000, was presented in 1928 and named the Alexander P. Anderson and Lydia Anderson Research and Fellowship Fund. Later, Dr. Anderson promised to make the total fund $25,000 by sending sums of money whenever he found it possible, and the next gift, $2,500, came in January 1942. Dr. Anderson died May 7, 1943, and his estate has carried out his promise to complete the fund by remitting $12,500. Income from this money is used for scholarships and the support for research.

E. P. Felt. Less than a month before his 76th birthday, Dr. Ephraim Porter Felt, Director and Chief Entomologist of the Bartlett Tree Research Laboratories, Stamford, Conn., died. As one of the first instructors in the Science Course for Professional Gardeners, giving a course in entomology when it was organized in 1932 and for several years thereafter, Dr. Felt began a period of close association and helpful cooperation with the New York Botanical Garden. After the hurricane of September 21, 1938, he served, with Dr. B. O. Dodge and W. O. Filley of New Haven, on the committee for the Eastern Shade Tree Conference which was called under the Garden's auspices, meeting December 8 and 9, 1938.

Active in several entomological societies, Dr. Felt was also editor of the Journal of Economic Entomology from 1908 until 1935, and honorary editor since then. Throughout the years he wrote extensively. Among his contributions are included many technical papers both long and short, as well as popular books and articles. "Insects Affecting Park and Woodland Trees" was the title of a two-volume Memoir of the New York State Museum, published in 1905-6. "Key to American Insect Galls" was published in 1917 as New York State Museum Bulletin 200. His "Manual of Tree and Shrub Insects" followed in 1926; "Our Shade Trees" in 1938; "Plant Galls and Gall Makers," and "Insects and Diseases of Ornamental Trees and Shrubs" in 1940; "Pruning Trees and Shrubs," 1941; and

"Shelter Trees in War and Peace" in 1943.

For the Journal of the New York Botanical Garden he contributed "Insects in Relation to Plant Life" in 1931 and "Results of Recent Research in the Control of Pests on Trees" in 1938.

At Dr. Felt's funeral on December 17, Dr. Dodge represented the Garden.

Annual Meeting. Five new names were added to the membership of the Corporation of the New York Botanical Garden at the annual meeting held Jan. 4. They are Mr. S. P. Miller of Scarsdale, Technical Director of the Barrett division of the Allied Chemical and Dye Corporation, New York City; Mr. Edwin De T. Bechtel, who was elected a member of the Board of Managers Sept. 30; and Mrs. Henry S. Fenimore Cooper, Miss Mildred McCormick, and Mrs. Rodney Procter, who were all elected to the Garden's Advisory Council during the year. Miss McCormick was chosen Nov. 30. Mrs. Melvin Sawin was also elected to the Advisory Council at the annual meeting.

All officers of the Garden were re-elected, and the seven members of the Board of Managers whose three-year terms of service were expiring were re-elected in the class of 1947. They are Dr. E. C. Auchter, Marshall Field, Mrs. Elon Huntington Hooker, John L. Merrill, Col. Robert H. Montgomery, H. Hobart Porter, and Prof. A. Percy Saunders. Instead of reading the complete report this year, Dr. Robbins followed the introductory pages with the showing of an abbreviated version of the Garden's motion picture.

Christmas Display. A Nativity scene was shown for the third consecutive year in House 4 of the Main Conservatories during the Christmas season just past. As before, it consisted of a view of the yard of the inn at Bethlehem, with the manger, a shed where hay, sorghum, rue, onions, and husks of St. John's bread, or carob, were being dried; a sign in Hebrew lettering pointing to the inn, a star shining high in the trees, and a number of plants that are native in the Holy Land appearing in the foreground. These included the giant reed, olive, bay, myrtle, fig, sycamore fig, carob, and dandelion. More space was devoted to the scene than in previous years. Life-size figures of the Holy Family and three shepherds again were used.

Christmas Gifts. Through a small weekly sum that has been voluntarily given by staff members and employees of the New York Botanical Garden, the 39 former employees who are now serving in the armed forces of the United States were each sent a Christmas gift of five dollars besides a leather case and a package of cigarets. Gifts have been sent to the men periodically for the past two years.

Visitors. Dr. Mildred Mathias (Mrs. Gerald Hassler), whose work on the Umbelliferae, with Lincoln Constance as co-author, is now being edited for *North American Flora,* spent the day at the New York Botanical Garden Dec. 16, while on her way back to California after a year spent in the East.

Robert M. Warner, who has been doing research on rubber in Liberia, was at the Garden Dec. 9. Other visitors of the month included Dr. Charles Thom of Port Jefferson, L. I., and Dr. John D. Dwyer of Union College, Albany.

Alaska Film. Prof. Dow V. Baxter of the University of Michigan, who was visiting the Garden several days in early December, showed his colored motion picture film, "On and Off Alaskan Trails" to members of the staff and guests Dec. 8 in the Members' Room.

Retiring. Fleda Griffith, who has been Artist and Photographer at the Garden since 1932, left at the end of the year with the plan of doing some creative photographic work in her studio at home. Miss Griffith has been responsible for the photographic recording of the scientific work done at the Garden, particularly in the laboratories of Drs. Robbins, Stout, and Dodge. Since 1937, most of the Journal covers have been her work, as well as the majority of illustrations in the Journal. Lantern slides made for illustrating lectures by members of the staff have been made and colored by her. She has also done all of the work on the Garden's motion picture in natural color, which was begun two years ago and which has since been extensively shown in New York, in other cities of this country, and in Mexico. She has also compiled, from

her own work, several shorter films of the Garden, one of which has been widely shown in South America.

Miss Griffith studied photography at Columbia University, under Clarence H. White after a number of years spent coloring slides for explorers and lecturers. She also studied art at the Grand Central School in New York City. For several years before becoming a member of the staff, she did a great deal of free-lance photography for the Garden.

Hinton Herbarium Received

Approximately 65,000 sheets, representing probably 5,000 species of plants from Michoacán, have been received by the New York Botanical Garden from the estate of George B. Hinton, botanical collector who died in Mexico last spring. The material arrived in New York in December packed in 330 boxes which weighed a total of a ton and a half.

Arrangements for the purchase of this important collection were made with the collector's son, James Hinton, by Dr. H. W. Rickett. After the collector's death, the specimens were stored in the small town where he had lived; had they not been promptly taken over by an institution equipped to care for them, they would probably have been soon destroyed by insects. Acquisition of the collection by the Garden thus means that valuable specimens are saved for scientific study. One complete set of the plants will be sent to the Mexican Government in return for permission to export the remainder.

The majority of the species in the collection have been identified by specialists in different parts of the world—a number of them at the New York Botanical Garden—and a great many new species have been based on the Hinton plants.

Michoacán, where most of the collections were made, is a mountainous country marked by evidences of past volcanic activity, and in this state is Paricutín, Mexico's newest volcano.

Dr. Stewart Returns to India

Dr. R. R. Stewart left the first of January to return to his post as head of Gordon College, Rawalpindi, India. During the period of nearly two years that he has been serving as Acting Curator at the Garden, following nine months of his sabbatical year that was spent here, he has made extensive studies of the flora of India. The 5,000 numbers of herbarium specimens that he brought with him have all been identified, one complete set has been deposited in the herbarium, and duplicate sets have been sent to the Arnold Arboretum, Gray Herbarium, National Herbarium, and the National Arboretum.

The "Monograph on the Scrophulariaceae of the Western Himalayas" by F. W. Pennell, published in November 1943 by the Academy of Natural Sciences of Philadelphia, was based largely on specimens gathered by Dr. Stewart over thirty years in India with the help of Mrs. Stewart. For the introduction to this paper, Dr. Stewart prepared a descriptive account of the flora of the region. Also the paper on rusts by George B. Cummins, which appeared in the July-August number of *Mycologia,* was based on specimens collected in the Himalayas by Dr. Stewart, who identified each of the hosts. Dr. Stewart has also written on the grasses of the Punjab and the surrounding mountains, on the ferns of Kashmir, also on the ferns of Gilgit, Baltistan, and Ladak; the vegetation of the Kashmir Valley and Lakes, and the flora of the Deosai Plains, most of which will be published in periodicals that are edited at the Botanical Garden. For the Year Book of the American Rock Garden Society (1942-43) he wrote on "Alpine Flowers of Kashmir."

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PUBLICATIONS OF THE NEW YORK BOTANICAL GARDEN

Books, Booklets, and Special Numbers of the Journal

An Illustrated Flora of the Northern United States and Canada, by Nathaniel Lord Britton and Addison Brown. Three volumes, giving descriptions and illustrations of 4,666 species. Second edition, reprinted $13.50.

Flora of the Prairies and Plains of Central North America, by P. A. Rydberg 969 pages and 601 figures. 1932. Price, $5 50 postpaid.

Plants of the Vicinity of New York, by H. A. Gleason. 284 pages, illustrated. A handbook especially compiled for the beginner in plant identification. 1935 $1.65.

North American Cariceae, by Kenneth K Mackenzie, containing 539 plates of *Carex* and related plants by Harry C. Creutzburg, with a description of each species Indexed. 1940. Two volumes, 10¾ x 13½ inches; bound $17.50; unbound $15 50

Keys to the North American Species of Carex by K. K. Mackenzie. From Vol. 19, Part 1, of *North American Flora.* $1.25.

Plants of the Holy Scriptures by Eleanor King, illustrated, and accompanied by a list of Plants of the Bible with quotations, in the March 1941 Journal. 15 cents.

Food and Drug Plants of the North American Indian. Two illustrated articles by Marion A. & G. L. Wittrock in the Journal for March 1942. 15 cents.

The Flora of the Unicorn Tapestries by E. J. Alexander and Carol H. Woodward. 28 pages, illustrated with photographs and drawings; bound with paper. 1941. 25 cents.

An Herbal. First published by Richard Banckes in London. 1525. Edited and transcribed into modern English with an introduction by Sanford V. Larkey, M.D., and Thomas Pyles. 200 pages, including facsimile of original. Prepared by Scholars' Facsimiles and Reprints. 1941. Price to members of the Garden, $2.50; to others, $3.50

Succulent Plants of New and Old World Deserts by E. J. Alexander. 64 pages, indexed. 350 species treated, 100 illustrated. Bound in paper. 1942. 50 cents.

Catalog of Hardy Trees and Shrubs. A list of the woody plants being grown outdoors at the New York Botanical Garden in 1942, in 127 pages with notes, a map, and 20 illustrations. 75 cents.

Vegetables and Fruits for the Home Garden. Four authoritative articles reprinted from the Journal, 21 pages, illustrated. Edited by Carol H. Woodward. 1941. 15 cents.

The Victory Gardens of 1942 and 1943 at the New York Botanical Garden, with plans and suggestions for home growers, by T. H. Everett. 24 pages, illustrated, paper-covered. 1943. 10 cents.

Periodicals

Addisonia, annually, devoted exclusively to colored plates accompanied by popular descriptions of flowering plants. eight plates in each number, thirty-two in each volume. Now in its twenty-second volume. Subscription price, $10 a volume (four years) Not offered in exchange Free to members of the Garden.

Journal of The New York Botanical Garden, monthly, containing news, book reviews, and non-technical articles on botany and horticulture. Subscription, $1 a year; single copies 15 cents. Free to members of the Garden. Now in its 45th volume.

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North American Flora. Descriptions of the wild plants of North America, including Greenland, the West Indies, and Central America. 100 parts now issued. Not offered in exchange. Prices of the separate parts on request.

Contributions from The New York Botanical Garden. A series of technical papers reprinted from journals other than the above. 25 cents each, $5 a volume.

Memoirs of The New York Botanical Garden. A collection of scientific papers. Contents and prices on request.

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

FOR ALL GARDENERS

THE prospect that the supply of canned fruits and vegetables for civilians will be still further reduced in the coming year means that city, suburban, and country people alike will need to take their victory gardening very seriously this spring.

As in years past, the New York Botanical Garden stands ready to assist individuals by answering questions on problems in gardening either in person or by mail or telephone. In addition, organized instruction is being offered as part of the institution's Educational Program. A six weeks' course in *Vegetable Gardening* starts Feb. 21, in ample time for directions to be followed for this year's planting. For those who have the daytime hours free, a *Three-Day Short Course in Vegetable Gardening* takes place March 27-29. Later, for those who want to learn the fundamentals that can be applied to any type of gardening, there will be a *Three-Day Short Course in Practical Gardening* April 24-26; and for those who want to know the best ways of keeping their plants healthy, a *Two-Day Short Course in Disease and Pest Control* June 6 and 7.

Meanwhile, two new courses are being presented —courses for which there has long been a demand: *Botany for Beginners*, commencing April 10, designed for gardeners craving a background of knowledge about the plants they grow, and *Plant Propagation*, beginning Feb. 26, with three Saturday afternoons of classroom work, followed by two short terms of practice in spring and fall in the greenhouse and outdoors.

Students in the *Two-Year Course in Practical Gardening*, will enroll in April for their term of work in Outdoor Gardening Practice, and in early May the class in Garden Construction, which is now part of the new one-year course in *Home Landscaping*, will begin.

As fruits begin to assume a place of importance along with vegetables, the two free lectures on fruit culture being given jointly by the New York Times and the New York Botanical Garden downtown the evenings of Feb. 24 and March 2 will be of special value to the home gardener this year.

In all of these classes the aim is to have useful information dispensed by instructors who are practical men rather than theorists. The classroom studies and practice periods can profitably be augmented at the New York Botanical Garden by observations in the demonstration vegetable garden and other plantings, by reference to the Garden's own publications on fruit and vegetable growing, and by the use of the library, where there is an abundance of literature on every type of gardening.

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Cover Photograph by Walter H. Hodge

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The Sugar Beet in Europe and America

By Eubanks Carsner*

ANDREAS SIGISMUND MARGGRAF, Director of the Physical Division of the Prussian Royal Academy of Science, laid the foundation for the great beet-sugar industry in 1747 when he published his epochal discovery that:

> ". . . sugar, this sweet salt, can be made out of our plants as well as out of the sugar cane."

Marggraf, a chemist, was interested in scientific knowledge and not in commercial exploitation of his findings. Franz Carl Achard, student and successor of Marggraf, was led by the achievement of his illustrious master to study and persistently develop good cultural practices for beets and manufacturing methods and finally to found at Cunern near Steinau in Silesia in 1802 the first commercial beet-sugar factory. Funds for the enterprise were granted by Friederich Wilhelm III of Prussia. It was during Achard's time that the terms "sugar beet" and "beet sugar" were introduced. Baron von Koppy, an ardent and energetic follower of Achard, in 1805 established a beet-sugar factory at Krayn near Strehlen, also in Silesia. The beet-sugar industry in Russia was also started in these first years of the 19th century.

Von Koppy, on the basis of Achard's and his own experience with sugar-beet growing and beet-sugar manufacturing, wrote in 1810:

> "There is no crop which has such a strong influence on the improvement of farm management, on the productivity of the soil, on the succeeding grain crop; no other manufacturing compares with beet-sugar production in its wholesome influence on numerous domestic industries and on the welfare of the nation."

Many European and American agriculturists, as well as informed industrialists, have held and hold the same opinion.

*Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration, United States Department of Agriculture.

Napoleon and Vilmorin

In France early development of the beet-sugar industry drew heavily on the pioneering experience in Germany. Napoleon became interested because of the difficulty of getting sugar from the West Indies. By his vigorous support the beet-sugar industry developed rapidly and extensively in France. But his defeat at Waterloo in 1815 followed by the lifting of the European blockade permitted resumption on an extensive scale of importation of cane sugar. Slave labor in the tropics made competition difficult and the French industry declined.

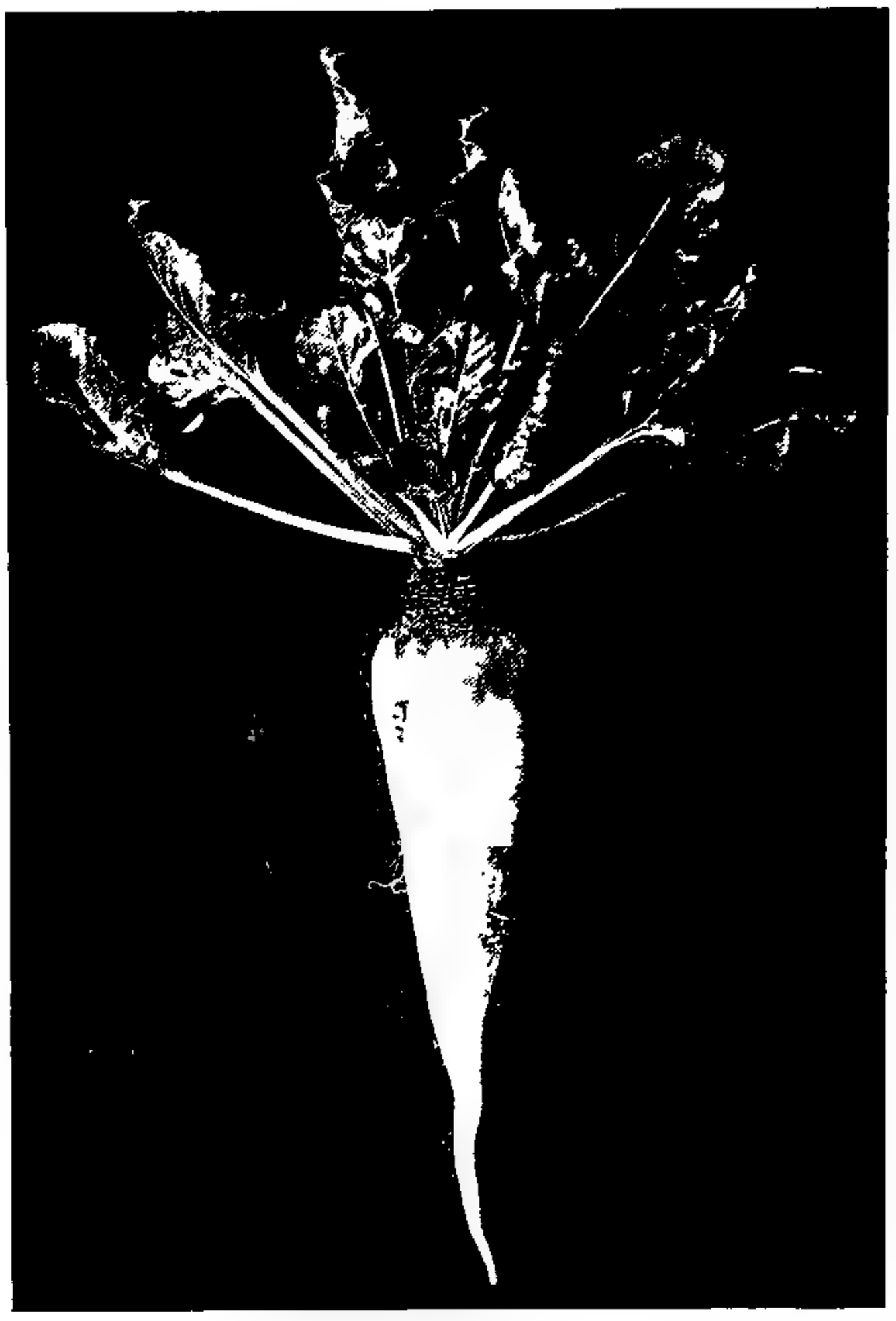
Revival and stabilization of the European beet-sugar industry was largely due to the efforts and writings of Count Chaptal. The outstanding agricultural contribution of this period to the beet-sugar industry was the beginning of sugar-beet breeding by the Vilmorin method. Philippe André de Vilmorin did selection work, probably in the latter part of the 18th century, but his son Louis de Vilmorin, through works published around the middle of the 19th century, founded the method of breeding still used generally in Europe for the production of commercial varieties.

Beginnings in the New World

American interest in sugar beets and beet sugar stemmed from France. James Ronaldson, first president of the Franklin Institute of Philadelphia (1824-1841) and also president of the Beet Sugar Society of Philadelphia, joined with several friends in financing a trip to France in 1836 by James Pedder for the purpose of investigating and reporting on beet growing and sugar manufacturing. Edward Church and David Lee Child at about the same time formed the Beet Sugar Company of Northampton, Mass. Both organizations imported sugar-beet seed and distributed it among farmers. Their efforts, including two important publications, are historically noteworthy even though these did not lead immediately to the establishment of the beet-sugar industry on this continent.

Western Pioneering

The Mormons fleeing across the plains and taking refuge in Utah contributed a picturesque even though disappointing episode to American beet-sugar history. "Sugar House," the designation of a ward in Salt Lake City, gets its name from the fact that there the Mormon Church, taking over an enterprise started by the Deseret Manufacturing Company, built the first beet-sugar factory in the West, the second in the United States. President Brigham Young had instructed Apostle John Taylor, then a missionary in France, to buy a complete outfit of machinery for making beet sugar. The machinery was bought in Liverpool, shipped by boat to New Orleans and up the Mississippi and Missouri rivers to Fort Leavenworth, Kansas, and then by an ox train of fifty-two teams across



The sugar beet, a white form of Beta vulgaris, used for the past two centuries as a source of sugar.

the plains to Utah. The factory was put in operation in 1853 and made syrup but apparently there was no one there who knew how to make sugar.

E. H. Dyer built the first successful beet-sugar factory in America at Alvarado, California. The factory was first built there in 1870 and 250 tons of sugar were produced that year. It continued to operate with slowly increasing production for the next three years but operations were discontinued after 1873 and the machinery was sold. Dyer equipped the factory again, enlarged it, and resumed operations there in 1879. That year should be regarded as the time when the first successful beet-sugar factory in America was started. The ownership has changed several times. The Holly Sugar Corporation, the present operator, has completely rebuilt and enlarged the factory.

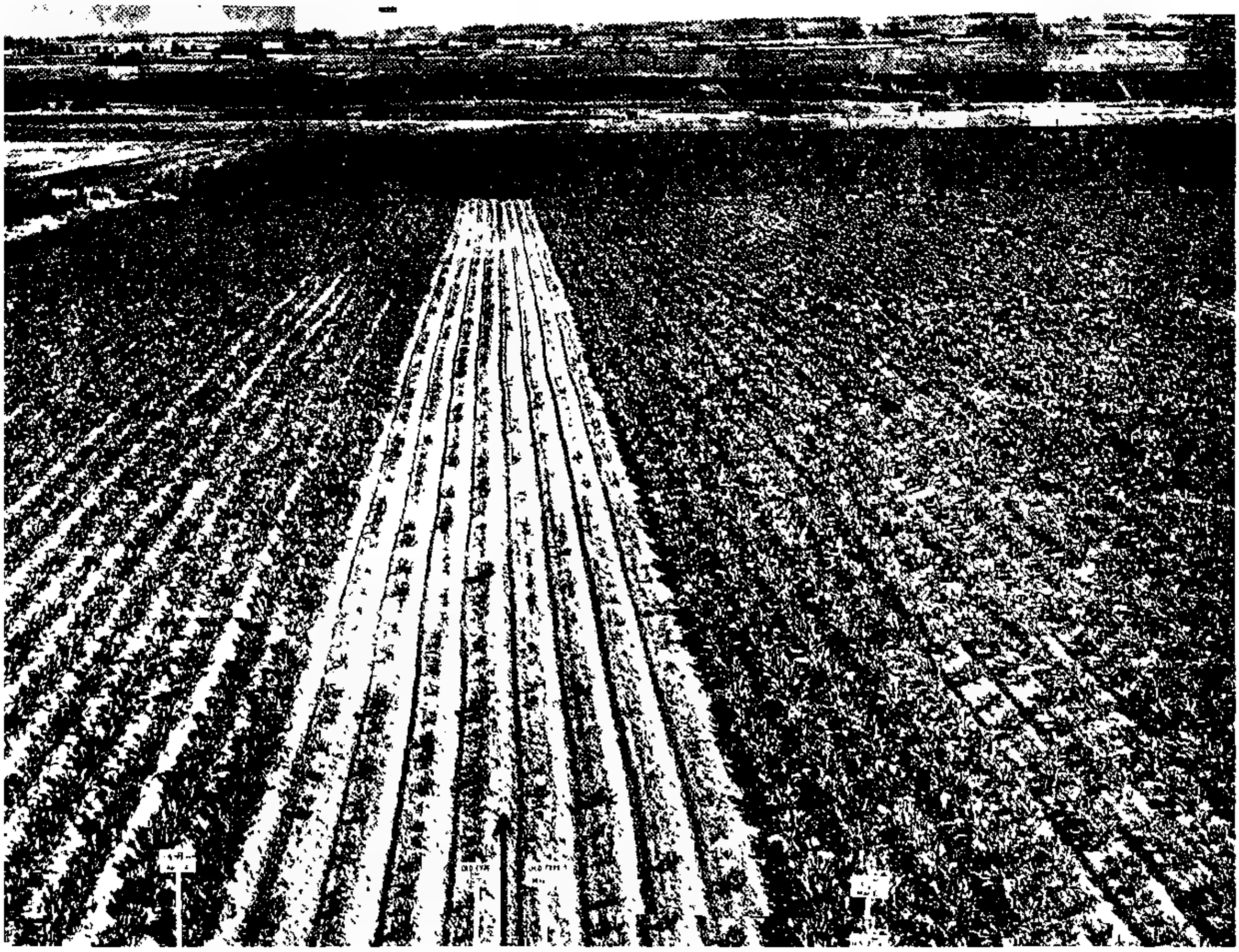
The next successful beet-sugar factory was built at Watsonville, California, in 1888, by the Western Beet Sugar Company, predecessor of the Spreckels Sugar Company. Soon after that the industry began to expand steadily. From Ohio and Michigan westward there are now eighty beet-sugar factories in nineteen states.

Curly-Top Menace

Curly top has been the dominant factor in recent important contributions to the advance of the American beet-sugar industry. This virus disease earlier caused more loss and later resulted in greater gains for the industry than any other single factor. Beginning in 1898, devastating curly-top epidemics at frequent intervals swept through some of the factory districts in California, Utah, Colorado, Idaho, Oregon, and Washington. There were 21,389 acres planted to beets in the Twin Falls, Idaho, area in 1934 and 18,635 acres (88%) were abandoned mainly because of curly top. The yield from the relatively small acreage harvested averaged only 4.88 tons

CURLY-TOP RESISTANCE BREEDING FIELD NEAR TWIN FALLS, IDAHO

Left of the arrow, is a four-row strip of "Old Type" (European variety) and adjacent to it are four rows of "Improved U.S. 22" and other resistant varieties, planted April 11. Right of the arrow is a four-row strip of "Old Type" and adjacent to it are four rows of "Improved U.S. 22" and others planted May 1. Photographed August 6, 1941.



per acre. The destructiveness of this 1934 epidemic is indicated by the fact that in the preceding season, a light curly-top year, 25,612 acres were harvested with an average yield of 13.78 tons per acre. Factories costing in the aggregate millions of dollars were abandoned. Fine farming areas gave up trying to grow sugar beets, losing an important cash crop and one greatly needed for the best diversified farming. The industry west of the Rockies was in dire straits when relief came.

Comeback of the Industry

Plant breeding and related investigations have resulted in a degree of curly-top control so effective that this disease is no longer a limiting factor in the areas where it occurs. Beet-sugar factories have been rebuilt in districts previously abandoned. The first curly-top-resistant variety released for grower use, called "U. S. 1," was only moderately resistant. However, nineteen separate field tests of this variety in one factory district in 1931 showed an average increase in yield of 4.7 tons per acre over European varieties, and consequent use of "U. S. 1" encouraged growers and sugar companies both to produce while better varieties were being bred. The progress thus far made in breeding for increased curly-top resistance is indicated by the following tabulated data from a test in 1941. Purposely late planting and artificial measures to increase the severity of the curly-top exposure made the disease conditions very severe.

Variety	*Tons per Acre*
Old Type (European)	0.00[1]
U. S. 1	6.31
U. S. 33	8.40
U. S. 12	11.25
U. S. 22	14.32
Improved U. S. 22	16.61

With such a high level of curly-top resistance as has been attained, more emphasis can be put on combining it with other valuable characters. Resistance to other diseases, higher sugar content, and adaptation to peculiar regional conditions and to evolving mechanical operations are some of the characters that ought to be combined with high curly-top resistance.

American Seed Production

Sugar-beet seed-growing, a new industry in America, was established as a result of the need for multiplying American varieties resistant to curly top. Europe supplied nearly all the sugar-beet seed used in the United States up to a decade ago. Now enough seed is produced here to meet all domestic and Canadian requirements and have some for export. Varieties better adapted to various American conditions have been developed and are multiplied in the seed-growing districts. These include some varieties

[1] No marketable beets produced.

resistant to *Cercospora* leaf spot, a disease serious in areas where curly top does not occur. Establishment of sugar-beet-seed growing, an outcome of curly-top control by breeding resistant varieties, has completed the integration of the American beet-sugar industry.

The foundation for the method of sugar-beet-seed growing generally used in America was laid some years before curly-top-resistant varieties became available and led to extensive employment of the method. Instead of the European method of growing the beets in one season, digging and storing the plants over winter and transplanting them in the spring, a much less laborious practice is involved in the American method. The seed is planted in late summer or early fall, the plants allowed to stand over winter in place, usually without thinning, and the seed harvested the following summer. The method permits mechanized procedures that eliminate much of the hand labor involved in the transplanting method. Average yields are higher, too, in the better adapted areas.

The sugar-beet-seed industry in this country is still young and much remains to be done before it is thoroughly stabilized. Agronomic and physiological investigations have markedly improved cultural practices and guided the selection of climatically suitable areas. By such means the factors influencing thermal induction of flowering are largely subject to control and are now much better understood than they were when sugar-beet-seed growing in this country was first started.

Segmenting the Seed-ball

Mechanization of sugar-beet growing operations has received a great deal of investigation in the last few years and encouraging progress has been made, especially in the development of harvesting machinery. Rediscovery of the possibility of using mechanically cracked or "segmented" seed has been an outstanding recent development. The beet-seed ball is a multiple fruit and consequently the resulting seedlings are often so closely spaced as to make thinning laborious and expensive. Breaking the seed balls up into pieces containing a reduced number of seed makes possible elimination of some of the thinning effort. Mechanical problems involved in the satisfactory cracking of the seed balls and the distribution of the segmented seed in planting are being extensively studied. Mechanically cracked seed was introduced from Germany many years ago but did not prove generally acceptable. The difficulties encountered then were largely the same as those troublesome now. The degree of satisfaction obtained with segmented seed in the past season seems likely to lead to such improvements in cracking and planting as to insure permanent adoption of its use.

Russia has led the world in beet-sugar production, with Germany second and the United States third. Approximately one-third of the world supply of sugar comes from sugar beets. The wholesale value of the sugar pro-

SUGAR-BEET SEED FIELD IN ROGUE RIVER VALLEY NEAR MEDFORD, OREGON

An example of the overwintering-in-the-field method of seed growing. Planted early September, 1941. Photographed June 26, 1942.

duced from beets in the United States in 1941, the last year for which statistics have been published, was approximately $145,000,000. A long advance has been made in a little less than two hundred years since Marggraf reported the results of his research.

PERCY WILSON

SUCCUMBING to an illness of many years' duration, Percy Wilson died the night of Feb. 6. He had been a member of the staff of the New York Botanical Garden since 1899, and was active in his work until five years ago, when he was retired from his post of Associate Curator. During his early years he worked in close association with Dr. N. L. Britton, and through his explorations with him he became an authority on the flora of the West Indies. An appreciation of Mr. Wilson by Dr. H. A. Gleason will appear in a forthcoming number of this Journal.

Hunting Cinchona in the Peruvian Andes

By Walter H. Hodge*

Photographs by the author

FEW war essentials have as high a priority rating as cinchona bark. Ever since the fall of Java, formerly the source of 95 percent of this strategic product, the United States has been on the spot as regards her stock of this sole source of quinine—the oldest and best of the anti-malarials. Without quinine, battles in the tropics can easily be lost, for malaria is an ally of the enemy. Java will be retaken, however, and by Americans using American quinine. For after all, cinchona bark, like hevea rubber, is a pure-blooded American which became expatriated only at man's interference.

The bark of the cinchona tree is one of this hemisphere's most important contributions to the world's drugs. Andean aborigines had probably long known and used the dry bark as a febrifuge and soon after the coming of the conquistadores cinchona became known to European civilization. First mention of the curative properties of quinine was made in 1628 by a Spanish friar in a manuscript only recently unearthed in the Vatican library. From that time to the present, montane forests from Ecuador to Bolivia have been ransacked for their supplies of this precious bark.

The Province of Loja in southern Ecuador first achieved fame as an important source of cinchona, and up to the year 1750 it was the headquarters for the industry. By the middle of the last century, however, exploiters realized that the wild stands in the Andes would never be able to supply the increasing world demand for quinine. Interested persons employed botanists who were sent secretly into the richest of the Andean cinchona regions to collect quantities of the tiny winged seeds. Seedlings raised from these eventually found their way to India and to the Dutch East Indies, where with tender care, scientific selection, and the aid of a bountiful and cheap labor supply, there grew into being the great plantation cinchona industry. In Java there were produced strains of the genus (for instance, the famous *Ledgeriana* stock) with bark that far surpassed, in the percentage of cinchona alkaloids contained, all barks ever found in the Andean home forests. Little wonder then that in recent years Java has provided the world with practically all of her quinine, and little wonder that quinine prices have been rigidly controlled by a single Dutch monopoly.

After Japan's island conquests in the south Pacific, climaxed by the capture of Java, the United States Government immediately shifted into high on the road to cinchona bark procurement. Under the direction of the

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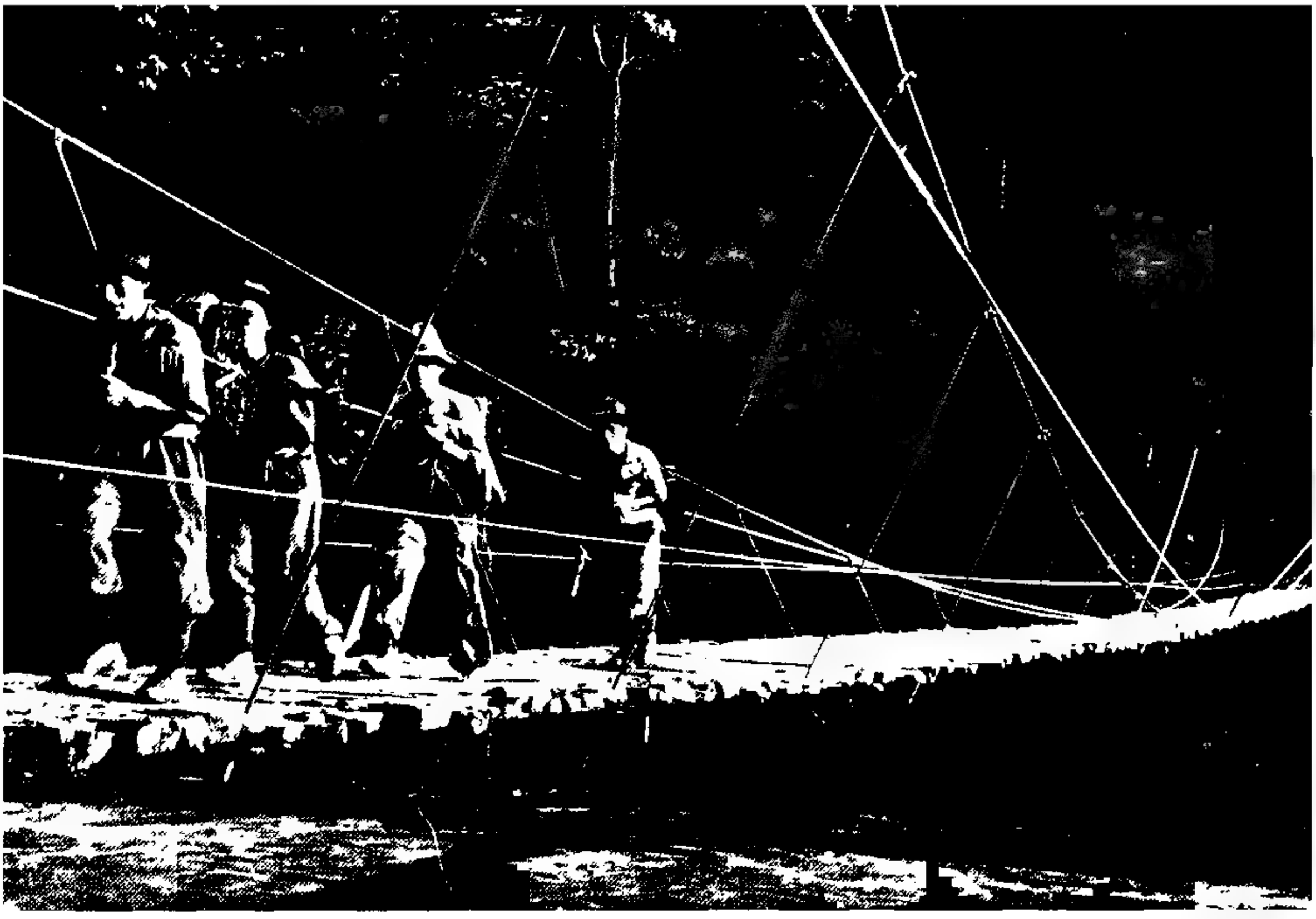
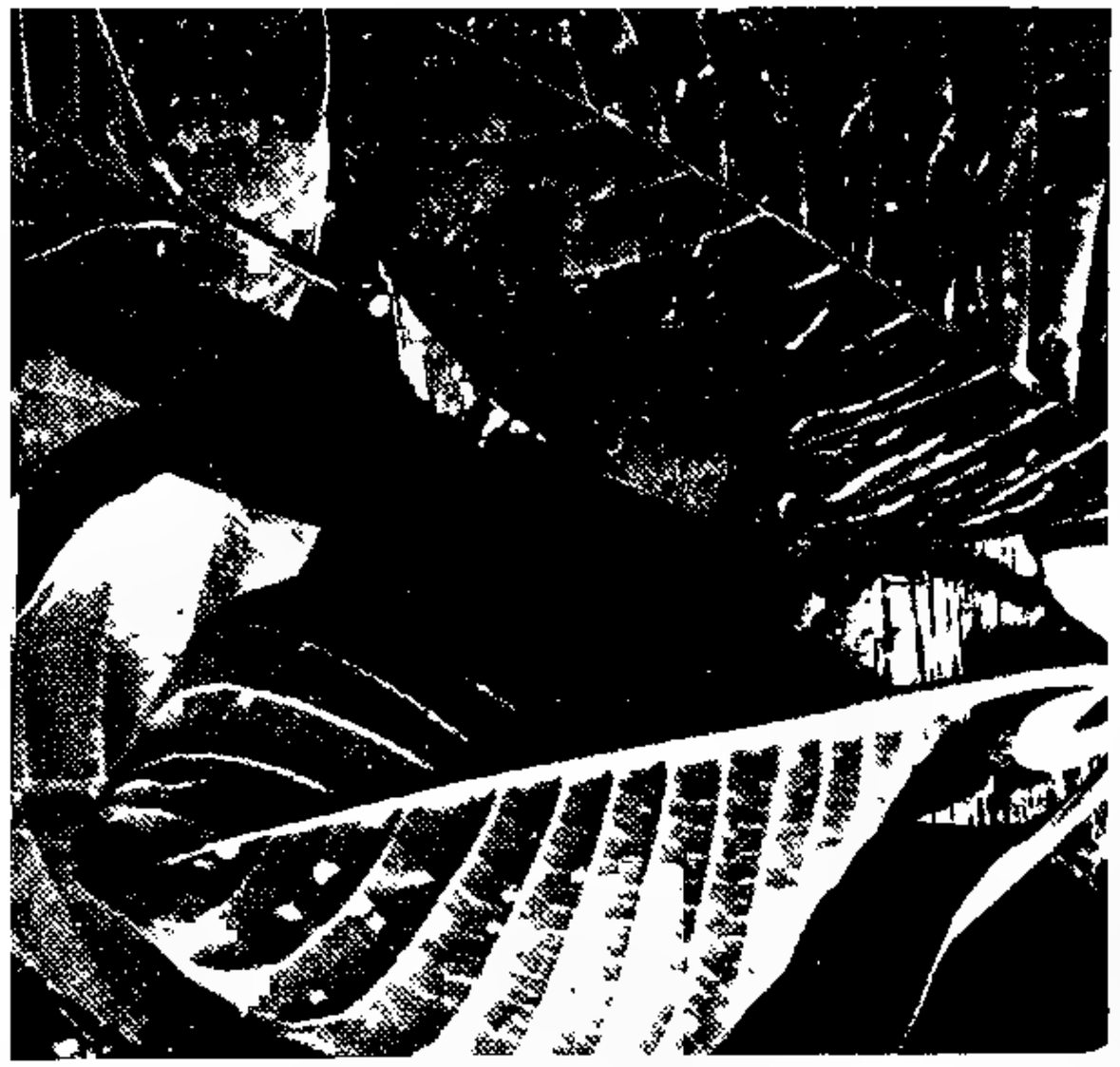
* Dr. Hodge, on leave from the Department of Botany of Massachusetts State College, is engaged in cinchona procurement in Peru for the United States Government, Office of Economic Warfare.



Cascarilleros bringing in loads of freshly stripped bark from Oroya on the Inambari River, with a cinchona forest in the background.

Office of Economic Warfare a study was made of the old South American industry and plans were drawn up to make this region an immediate, safe, and independent source of bark. Survey parties, each composed of a botanist and forester, were recruited. They have been searching the cinchona areas, scattered from Colombia to Bolivia, for over a year, seeking out the old stands and finding many a new one. The urgent need for quinine has permitted the exploitation of species long considered of little value because of the relatively low percentage of alkaloids contained in their bark. These "ugly ducklings" are abundant in the forests and until that time when our new Latin American plantations have attained an exploitable age, these low grade species will serve as good pinch hitters for plantation-grown cinchona.

Peru holds in her mountain fastnesses the very heart of the cinchona belt. No other Andean country possesses as many species of this variable genus, and today when the need for this bark is so great, Peru is proving to be one of our most important sources. In Peru cinchona is to be found in the highest mountain forests which cover the eastern slopes of the Andean ranges. Commercial species can be found growing from the upper limits of tree growth at about 10,000 feet down to the beginnings of Amazonian forest at the 2,000-foot level. The belt occupied by species of cinchona is a region of unbelievable beauty unmatched by any forested



zone in this hemisphere. This area is the fountainhead of many an Amazonian river—the Tambopata and Inambari, the Madre de Dios and Apurimac; the Beni, Marañon, and Huallaga. Born in the snowfields that top most of the eastern ranges, hundreds of turbulent tributaries of these parent rivers fall through breathtaking gorges and ravines which so dissect the eastern slopes as to make this rugged area almost impassable. Yet from this land of "perpendicular plateaus" must come all of Peru's cinchona bark.

It is no easy job to reach the eastern forested slopes, which constitute the upper margin of what the Peruvians call LA MONTAÑA* (forest land). Approaching from the west two other phytogeographic sections of the country must be passed—LA COSTA, or dry Pacific coastland with its deserts and lomas, the latter supporting a peculiar periodic herbaceous vegetation depending principally on the atmospheric moisture of seasonal fogs; and LA SIERRA, comprising the bulk of the high mountain tableland, the old Inca homeland, with its cold deserts, dry valleys, grassy steppes which support the flocks of llamas, alpacas, and sheep, its heathlike formations, and the curious cushion-forming plants of the higher altitudes. Automobile roads of the coast and sierra are numerous but as they approach the border of the montaña most of them peter out, being replaced by mule trails or tenuous foot trails which now hug begonia- or calceolaria-clad cliff walls or which now descend precipitously, finally threading their way through the forested montaña. Parties surveying for cinchona in such terrain have walked over 200 "vertical" miles in a two-weeks' period, and under these conditions good hiking shoes seldom last for more than a month!

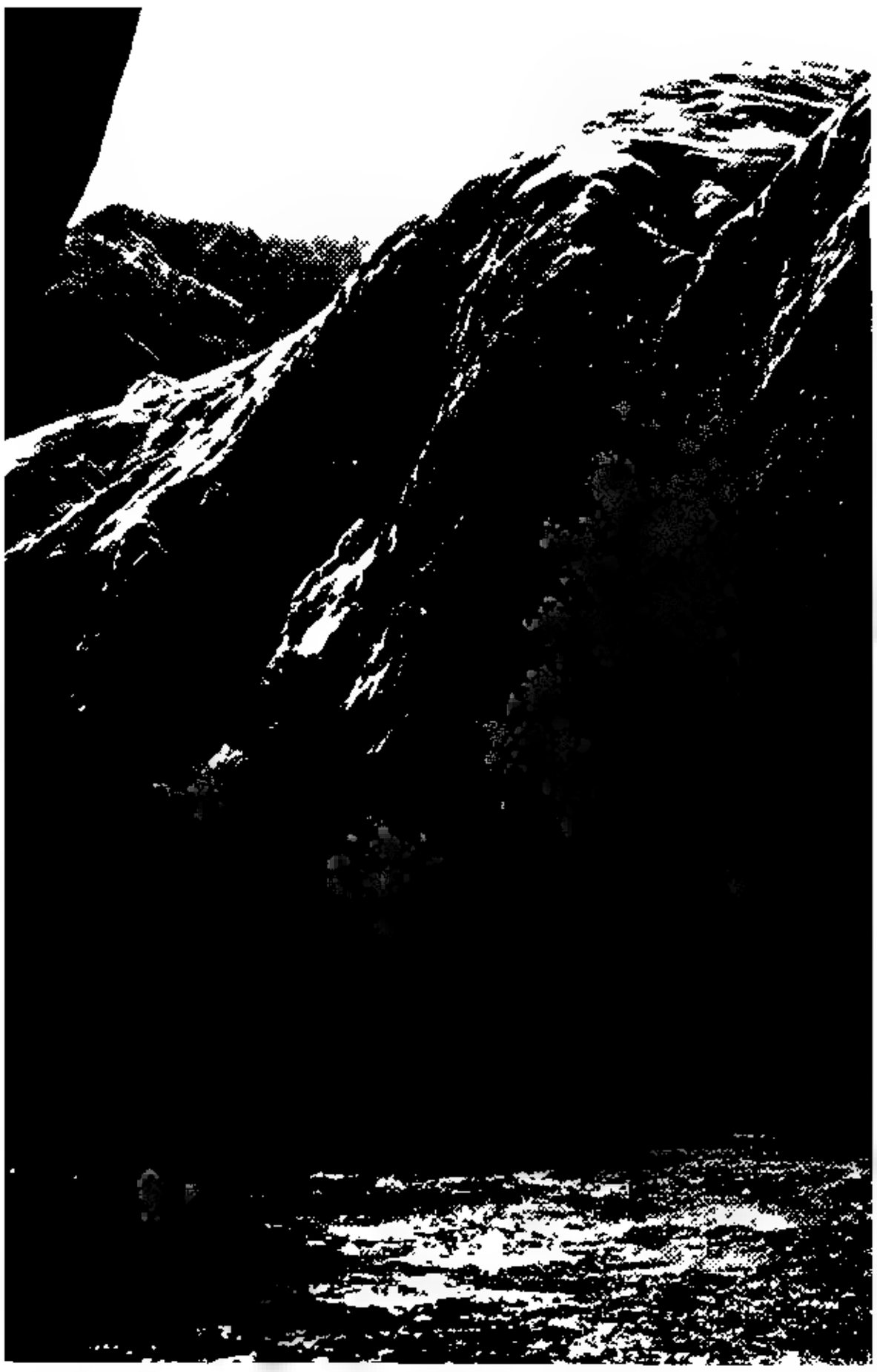
SOME OF THE PLANTS THAT ARE FOUND BY CINCHONA HUNTERS IN SOUTH AMERICA

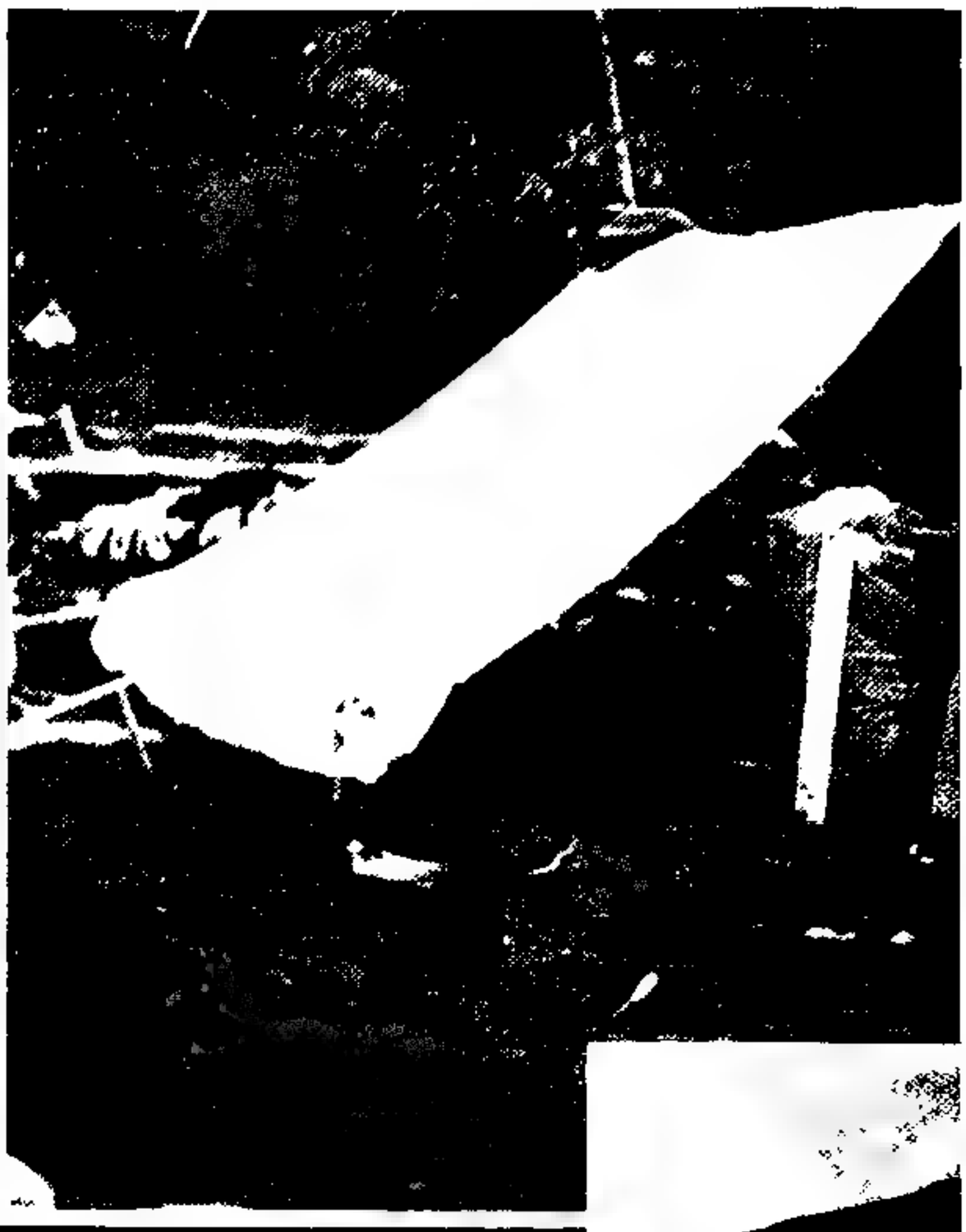
(Photographs on the opposite page)

UPPER LEFT: *Sprout shoots of a form of Cinchona micrantha called "huanuco" in northern Peru. Bark of this species is comparatively rich in alkaloids.* RIGHT: *Leaves of "monopol," another form of C. micrantha. The tips of a pair of stipules show at the bottom of the picture.* CENTER: *Flowers, capsules, and leaves of a "false cinchona" (Ladenbergia). The bark of this genus is the most frequent adulterant of true cinchona barks.* LOWER LEFT: *Inhabiting middle elevations is a large-leafed Cinchona pubescens. Its bark is usually of very low quality. The author is examining a seedling growing in the Cosñipata Valley.* RIGHT: *A flowering branch of a northern Peruvian form of Cinchona officinalis called "loja." This has been commercially exploited in South America longer than any other form of Cinchona.*

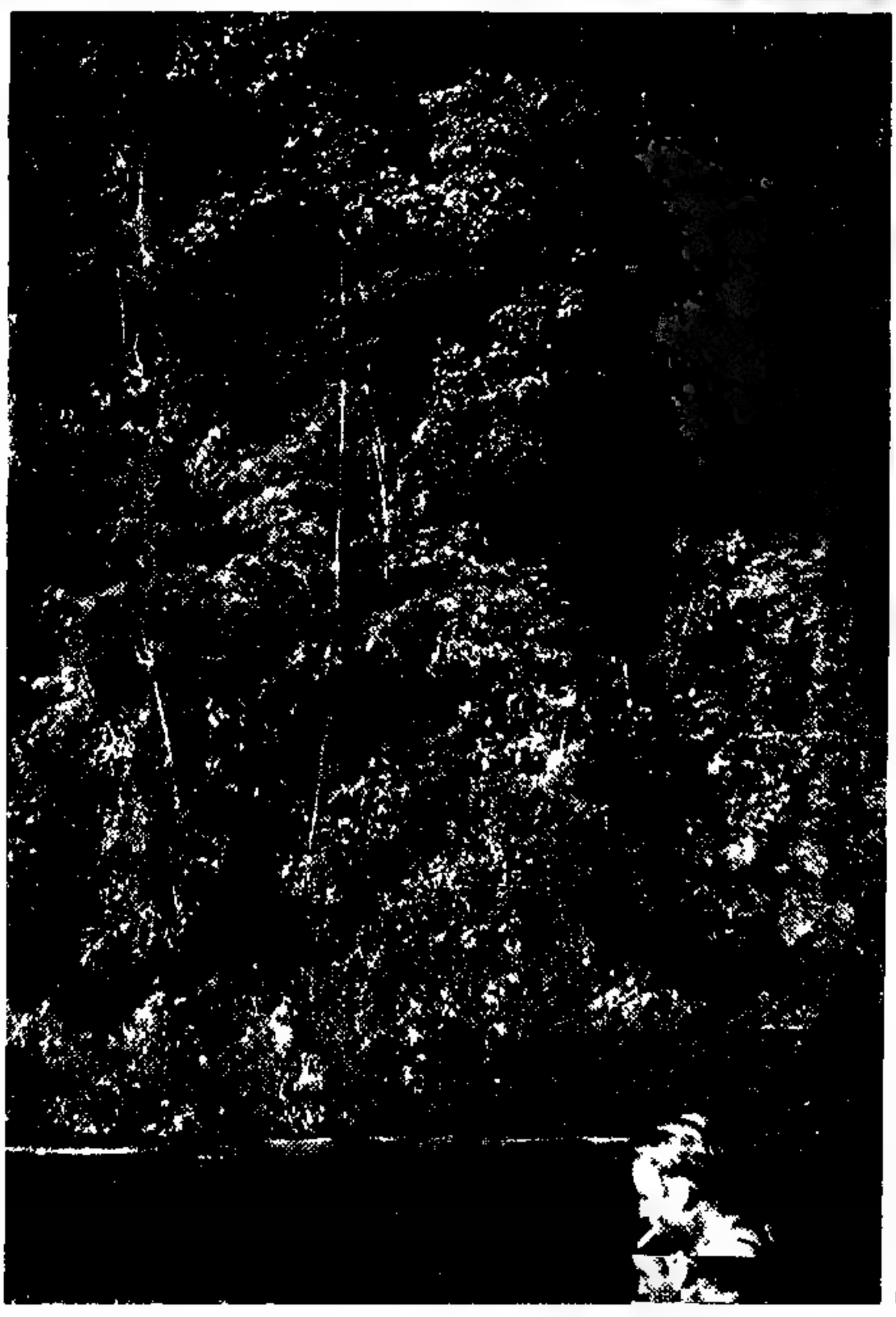
* In other Spanish-speaking countries generally called EL MONTE.

WITH THE U. S. GOVERNMENT QUININE HUNTERS IN PERU





Beginnings of cinchona forests in the precipitous Sandia valley in southeastern Peru.



Poor grades of cinchona occur at the highest elevations, in a shrub-type forest like this in the Sandia valley (center, below).

Cinchona rainforest bordering the Huari-Huari river, vicinity of Oroya. "Monopol" (Cinchona micrantha) is the most important species here. ➔

Photographs by Walter H. Hodge

The rocky trail that leads to the cinchona forests in the Tambopata and Huari-Huari valleys in southern Peru.

Overnight camp of cinchona hunters on the Huari-Huari River (center, above).

Rain-forest in the Cosñipata valley. Leaves of Cinchona pubescens can be seen on the left as well as palms and tree ferns characteristic of this forest.

Forests containing cinchona trees may vary considerably in general aspect. At higher elevations the forest tends to be low and thicket-like, and since moist blankets of clouds often settle for long periods at these elevations, the branches of the trees are generally festooned with pendent mosses, delicate hepatics, filmy ferns, bromeliads and tiny orchids. Plumose bamboo-like CHUSQUEAS often form impenetrable thickets. In addition to the mossy forest one also finds the more familiar mountain rainforest with its scattering of graceful tree ferns and palms. This forest is of moderate height, and covers most of the montaña of middle elevations. It is in the mountain rainforest, with its climate tempered somewhat by the elevation and subject often to over 200 inches of rain, that the greatest quantity of available cinchona species are to be found.

The genus *Cinchona* is a botanical headache. In Peru only three species have commercial importance, but these three—*Cinchona officinalis*, *C. pubescens*, and *C. micrantha*—have a great variety of leaf forms, making their classification difficult. Of the trio named, *Cinchona officinalis* has the greatest economic importance because certain of its forms possess bark very rich in alkaloids. Most if not all of the important plantation strains developed in the Dutch East Indies have originated from stock of this species collected in southern Peru and neighboring Bolivia. And today in Peru the forms of *Cinchona officinalis* are still the prizes of the CASCARILLERO, or cinchona hunter.

Bark increases in value in proportion to the percentage of crystallizable alkaloids contained, so one finds the best price paid for the form ot *C. officinalis* called CALISAYA, found principally in Peru, in the valley of the Tambopata river but extending into the forests of nearby Bolivia. Unfortunately wild calisaya has been exploited for generations and only small quantities of the bark now find their way into the markets. Another form of *C. officinalis* called LOJA (having taken its name from a province in southern Ecuador) is also much sought after in the mountains of Cajamarca, a state of northern Peru, but this form is less valuable than calisaya although it claims fame as the first bark used in medicine. Curiously enough there are forms of *C. officinalis* containing practically no cinchona alkaloids. This is even more striking in forms of *C. pubescens* which in one locality may possess merchantable bark and in another locality, where growing conditions appear to be identical, it may possess totally worthless bark. Such anomalies still remain unexplained.

Species of *Cinchona* have a definite altitudinal distribution. One has to be a gymnast in order to clamber about in QUEBRADAS with precipitous walls where *C. officinalis* delights in growing. Seldom is this tree found below 6,000 feet and from this elevation it ascends with the mossy forests to that point where they begin to peter out at 10,000 feet. Growing in difficult sites at such elevations *C. officinalis* is generally a small tree. Forms

SOME BARK TYPES OF NORTHERN PERU

Left to right, by pieces: "Loja" (C. officinalis); "amarilla" —2 pieces (C. pubescens); "huanuco" —4 pieces (C. micrantha); "colorada" —2 pieces (C. pubescens).

of *C. pubescens,* called AMARILLA, sometimes penetrate the range of *C. officinalis;* but generally speaking *C. pubescens,* which is usually unimportant commercially, is a species of middle elevations forming its heaviest stands between 4,000 and 6,000 feet. Growing in the lower elevations is *Cinchona micrantha,* generally known in northern and central Peru as HUANUCO and in southern Peru occurring in another form called MONOPOL. Monopol can be found anywhere from 4,000 feet down to 2,000 feet. Because it often grows in sheltered river valleys where soils are deeper and wind action is less, it generally is the largest of the commercial cinchonas, the trunk sometimes reaching a diameter of two feet. Though possessing a low grade bark its large size makes it very important, and in the present procurement program in Peru, monopol is proving to be the principal source of cinchona bark.

Bark harvesters apply the general term CASCARILLA to all the species of true cinchonas and "false cinchonas" (*Ladenbergia* species), but modifying names, such as CASCARILLA CALISAYA, CASCARILLA AMARILLA, etc., are appended to such forms as are very well known. As might be expected,

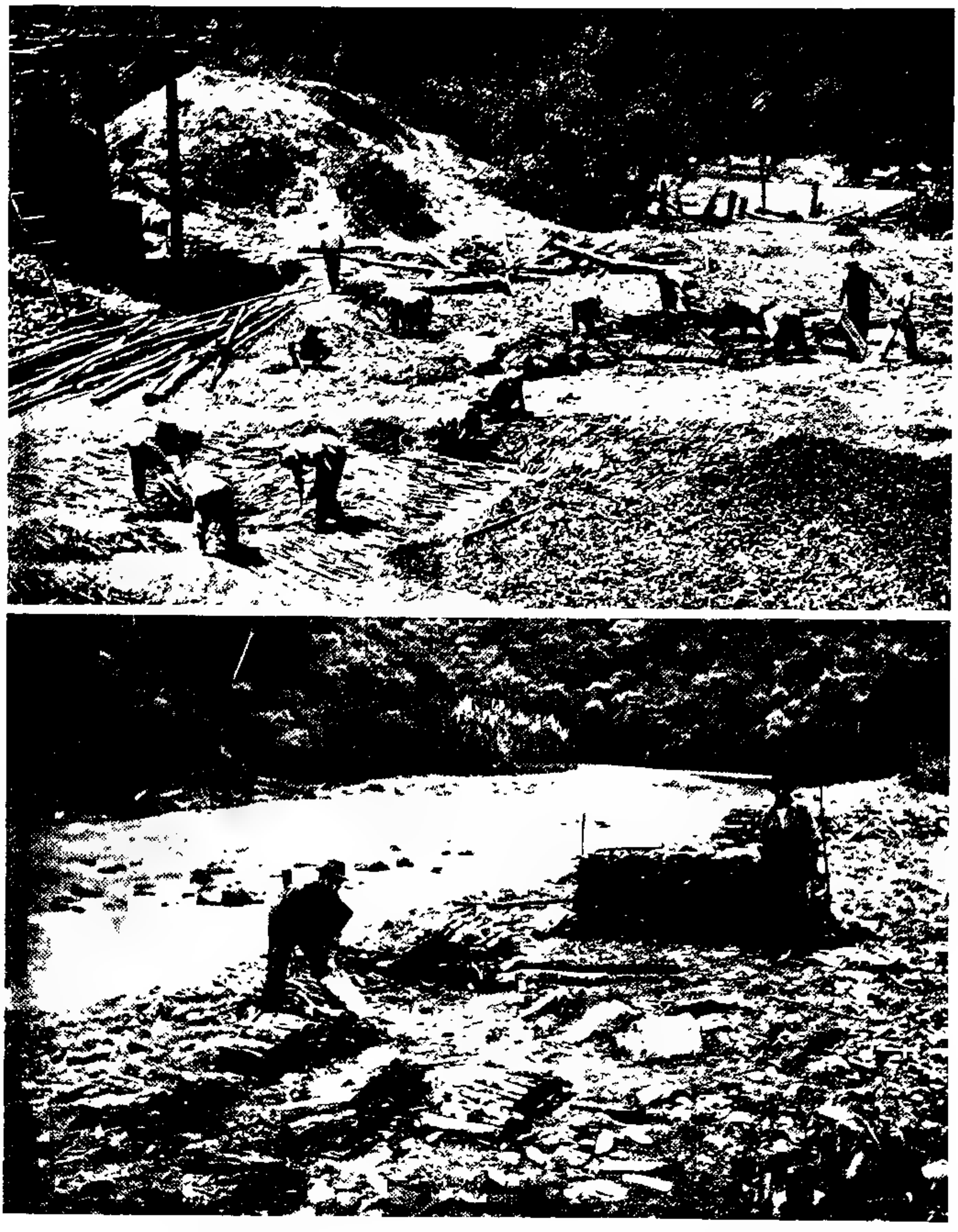
these modifying names are most frequent in those regions where cinchona bark has been harvested for the longest period. The men who actually cut bark in the forests also take their name from the word CASCARILLA, and are called CASCARILLEROS.

Peruvian cascarilleros are usually pure-blooded sierra Indians—lineal descendants of the Incaic race—who for some reason or other have quit their ancestral ALTIPLANO home and are now living on the uppermost fringe of the montaña. Many of them have small CHACRAS—tiny forest farms—where they may grow corn, bananas, coffee, YUCA (*Manihot*), PAPAS JAPONESES (*Colocasia*), or COCA (*Erythroxylon Coca*). At home and afield they are sure to have a stimulating wad of their favorite "chew," dried coca leaves, in their mouths and a bountiful supply in a colorfully woven little bag slung at their belts. In order to get a little extra spending money they may harvest a few QUINTALES of cinchona bark from the neighboring forests. Because of the urgency of drying the bark quickly, this work usually falls in the dry season roughly from May to December.

Cascarilleros have to know their forests for there are no rules on searching out cinchona trees. The saying is: "Cinchona is where you find it."

TWO CINCHONA TYPES—A WORTHLESS AND A USEFUL ONE—
FROM SOUTHERN PERU

LEFT: *C. officinalis grows at the highest elevations. This is a valueless, shrubby, narrow-leaved form.* RIGHT: *Photographing flowering branches of "monopol" (C. micrantha).*



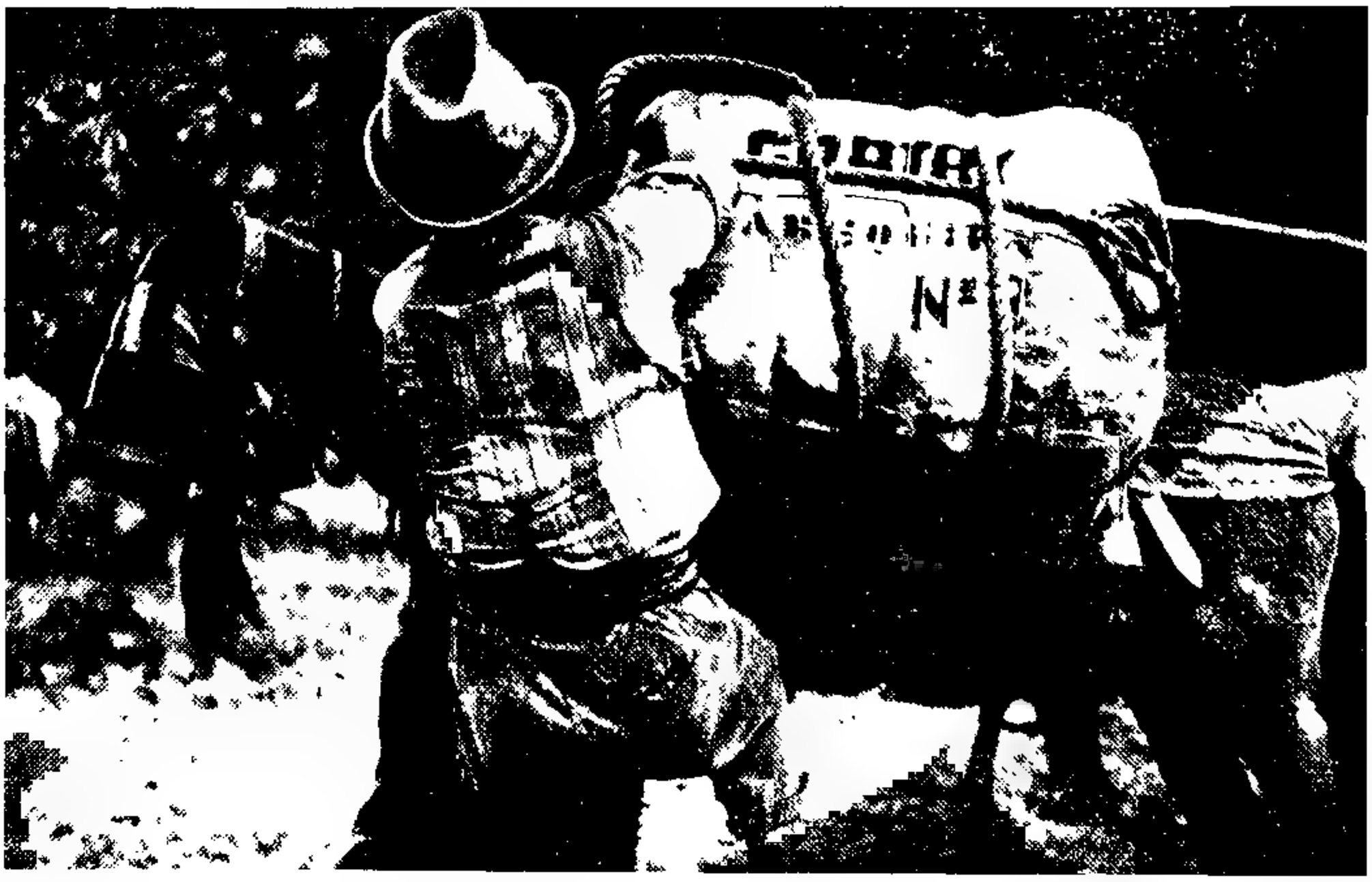
DRYING MONOPOL BARK FOR QUININE PRODUCTION

ABOVE: *Spreading it in the sun at Oroya on the Inambari. Under the frame (left) is an oven for artificial drying during rainy weather.* BELOW: *Working on the bank of the Sandia River.*

Usually, when a tree is seen it will be found to be a member of a small group of the same species, forming what the natives call a MANCHA. Several manchas may occur close together but just as often they may be a mile or more distant. This spotty distribution makes difficult the scientific estimates of the volume of bark available in a given cinchona district.

The universal tool of the cascarillero is the MACHETE with which he fells smaller trees not requiring an axe, and with which he peels the bark, cutting it off in strips of such a length as can be easily packed. The bark of the trunk, the bark of larger branches, and the bark of large roots—all is valuable. Cinchona bark varies in thickness and in external markings depending upon the age and upon the species. Some barks peel easily; others cling tightly All possess an exceedingly bitter-tasting inner surface which is yellowish-white when first peeled. The color turns in a few minutes to a rusty hue which lightens somewhat after the bark is thoroughly dried. Cinchona alkaloids are very sensitive to light and the color changes in barks are probably the result of this sensitivity; in general, barks rich in alkaloids change more rapidly and to a deeper color than do barks poor in alkaloids.

Cascarilleros work in small groups. One man may fell the trees, another trim the branches, while still another may strip the bark. Women and children often aid in the easier task of bark peeling. They may also help carry the fresh bark to an open area, often a river bank, where it is spread



Loading a mule with cinchona bark ready for shipment.

for the sun and air to dry it. The drying process is a critical one for, unless it is rapid and thorough, alkaloids are lost. Rapid drying is difficult in a rainy tropical region, and for this reason drying by artificial heat in ovens has been introduced in the more important cascarilla districts.

Once dry, Peruvian cinchona bark is ready for that chemical processing which will extract the valuable alkaloids. This is accomplished in the United States. Long before that can take place the bark must be moved by the crudest of transportation facilities—first by human back, by mules, or by burros, often over almost impassable trails, to the upper edge of the montaña: then by trucks which carry it over the rugged Andean backbone on the roughest of roads to the nearest railheads; at collection depots it is analyzed, sorted, and baled for export, and then one day, after a long ocean trip, the bark finally arrives at a North American port. Only then does its journey approach completion.

Notices and Reviews of Recent Books

(All publications mentioned here may be consulted in the Library of The New York Botanical Garden or may be purchased on order through the Library.)

Meals From Woods and Fields

EDIBLE WILD PLANTS OF EASTERN NORTH AMERICA. M. L. Fernald & Alfred C. Kinsey. 452 pages, illustrated; bibliography, index. Idlewild Press, Cornwall-on-Hudson, N. Y. 1943. $3.

If you have been reading this Journal for several years, you may recall an article[1] in which cattail spikes were said to make an excellent vegetable. So with an attitude perhaps of skepticism you pick up the Fernald-Kinsey book to see what these two botanical gourmets have to say.

But to open a book like this at random is a dangerous habit if you are looking for a particular subject. First you read that the young leaves of skunk cabbage really can be eaten if they are boiled in several waters with a pinch of baking soda. (I tried them once, insufficiently cooked and without the soda, and found that they tasted like French endive with a strong garlic dressing *plus* a fiery prickle that burned the inside of my mouth.) The golden-club (on the same page) has evidently given its Indian name of "tuckahoe" to a town in Westchester County. Both the seeds and the tuberous roots, when properly prepared, can be used for making bread. But this is a troublesome family to deal with unless one is seriously in need of food—or has a strong desire to experiment. The calcium oxalate crystals which inhabit the tissues of aroids make eating unpleasant unless they are disintegrated by drying, baking, or boiling.

Daylilies offer a much more palatable and accessible food, found along nearly any country roadside as well as in most gardens.

> **"The fully grown buds or the freshly expanded flowers of *Hemerocallis fulva* immersed in a batter of beaten egg, milk, flour, and seasoning and browned like fritters in oil or butter are a delicious and quickly prepared vegetable. . . . The fleshy tuber-like roots, borne in clusters like dahlia-roots, boiled in salted water, taste like a blend of sweet corn and salsify."**

The authors also quote from this Journal[2] on the use of daylily flowers by the Chinese in soups.

[1] Hopkins, Milton. Wild Plants Used in Cookery. March 1942.

[2] Stout, A. B. Gum-Jum or Gum-Tsoy: A Food from the Flowers of Daylilies. May 1933.

Dock leaves, you will find on another page, make an excellent potherb. (I will vouch for that, and will add that they are equally good in batter, like daylily flowers.) But few appreciate them, because of prejudice, and a neat little paragraph is quoted from Culpepper to prove the point.

Spicebush? It has always been tempting —and with good reason. The young twigs and leaves can be used for an aromatic tea, and the dried berries have been used as a substitute for allspice.

Two plants (and possibly many more) will provide a coffee-substitute, if they happen to grow in your region -the Kentucky coffee-tree and the wild senna; yes (turning the page), and the seeds of broom as well, though they are not recommended. But there is an inviting recipe quoted from Evelyn on the pickling of flower-buds of broom. That is something to know, since broom has begun to run wild over some of the sandy areas of the East.

Lamb's-quarters will furnish an acceptable flour for bread or muffins, as well as leaves for the potherb with which many are familiar, and the senior author tells an entertaining story of how his dinner guests first refused, and then finally relished the blackfish muffins he had made of ground lamb's-quarter seeds.

Leaves and dried flowers of one of the goldenrods (*Solidago odora*) can provide a tea substitute in time of need. Reading a few lines further, we find that the candied roots of elecampane have long had a use which, the authors say, "sounds like a substitute for bicarbonate of soda."

But what was the plant that we started to look up? It was cattails. So, turning back—and turning too far—we find that the tempting-looking berries of the common wild baneberry of the woods, also of the China-tree, are poisonous to eat. An extensive section is devoted to poisonous plants that might easily be mistaken for edible species. All are illustrated.

Finally, by looking in the index, we find three pages on cattails and how the different parts of the plant may be used for food.

Mushrooms, seaweeds, and lichens are treated at the end of the book, with emphatic warnings given against the poisonous fungi. Recipes for the edible species are offered, but this is the weakest part of the book. The recipes sound too much alike, and the information given about the beefsteak mushroom (*Fistulina hepatica*) does not conform to the observations of at least one well known mycologist, who has stated in this Journal[3] that in America it is known only on stumps of chestnuts.

Many of the thousand plants in the book have been actually tried by one or the other writer. If not, an authority is quoted for their use as food, and the reader is left to make his own decision as to whether or not he would like it.

The only thing I have personally tried —and enjoyed -which is not mentioned in the book is the winter stage of the exudation on red-cedar trees caused by the fungus *Gymnosporangium*. I seized it as possible relief after the skunk-cabbage episode, and found it had a resinous nut-like flavor and texture which made it eminently palatable. I can, however, only assume its safety on the basis of feeling no ill effects after munching half a dozen. And they did relieve the burning from the skunk-cabbage leaves.

CAROL H. WOODWARD.

The Rubber Problem

TREES AND TEST TUBES. Charles Morrow Wilson. 352 pages, bibliography, illustrations, index. Henry Holt & Co., New York, 1943. $3.

Despite its comprehensive title, this is a book about rubber—and rubber only, both natural and synthetic. It will be of signal value to the layman who wants to acquire a background for this much discussed subject; for the scientist it is not adequate.

The author, who has traveled extensively through rubber-growing countries, presents his knowledge clearly and entertainingly. The first part of the book is devoted to the various latex-producing plants, their cultivation, and the methods employed to extract the precious juices. At some length he discusses the social and economic status of plantation labor, and rightly concludes that no industry can nowadays be economically stable in which one set of indispensable workers earns from four to fifteen cents a day while another set, equally indispensable, gets a dollar and more per hour. The

3 Thomas, William S. The Beefsteak Mushroom. September 1937.

history of the leading eastern rubber companies, their political intrigues, commercial machinations and price fixings, to the detriment of the public and the benefit of absentee directors, is set forth and makes sorry reading.

Our own folly in neglecting the possibilities for the exploitation of *Hevea* in its original habitat, South America, is historically well developed. (Henry Ford is the great exception, but he has not been entirely successful.)

Instead of being pioneers in that field, our capitalists have preferred to put all their eggs into the Sumatran-Malayan basket. How thoroughly those eggs were scrambled is now sad history.

In his discussion of synthetics (or elastometers), the author presents in non-technical language the various methods of production, just now so widely and confusedly taken up by the public press. He tells us in terms of dollars, cents, and tonnage just what we can expect during the next few years; and he concludes that here, too, we are being sold down river. After comparing the "plant" cost of $200 per ton per year for rubber obtained from commercial waste-product alcohol with the cost of "from 700 to 1,000" per ton for that made from petroleum, the author sadly concludes (page 131, italics mine):

"It is noteworthy that the Rubber Reserve Corporation and the Co-ordinator of Rubber for the War Production Board *have chosen to regard rubber made from grain* or other vegetable alcohols as an *untried experiment and rubber from petroleum an accredited success*—a view not only unsupported but *flatly contradicted by the facts*. It is also noteworthy that the placid continuation of an exclusive rubber-from-petroleum experimentation would succeed in giving *unchallengeable control of the synthetic rubber industry* to fewer than twenty corporations, including *seven major petroleum companies and four rubber companies*, namely, Goodyear, Firestone, United States Rubber, and Goodrich, which in effect are assigned the immensely strategic mission of fabricating butadiene into rubber." We can see where that leads to.

The third part of the book deals with statistics, percentages of rubber used in all sorts of war material, the scrap and conservation problems, how to save your tires, and the like. Incidentally, the author is more pessimistic than events—so far—have warranted. He predicted that by the end of 1943 most privately owned tires would have been taken over by the government. But never mind, it may yet come to that.

ADRIAN VAN MUFFLING.

BROADCAST

BEGONIAS, if given proper moisture, light, and temperature, can be grown successfully in a sunroom even when they have to be left untended for ten days at a time, according to S. P. Miller, who spoke on the Garden's radio program Jan. 28. Mr. Miller has about 200 begonia plants of nearly 150 species and varieties in his own 12 by 24-foot sunroom in Scarsdale, New York, and he has solved the problem of keeping them growing in spite of the fuel shortage and the fact that he is often away on business trips. Some quotations from his radio talk are given here.

Managing the Plants When Away

"I experimented until I found a way of holding a small amount of moisture around the plants for a ten-day period. Once I tried ordinary wooden plant boxes, thinking that their self-insulating quality would keep the roots properly moist, but they were not successful. Finally, I had 15 wooden trays built, 3½ to 4 feet square and 6 inches deep, lined with builder's felt and roofing pitch to make them watertight, and I filled them to the top with builder's sand. I plunge my begonia pots deep in the sand, and keep the sand moist but not wet by dousing it with water from the top. It will stay moist for a week or ten days."

Temperature in the Sunroom

"Most of my plants grow successfully all winter long in a temperature as low as 40 degrees. A radiator mildly warm prevents freezing. Even though many of these plants have come from tropical regions, this temperature does not seem to be too cold for them. *B. imperialis,* for example, is a tropical begonia which

grows well under these conditions. If you accustom begonia plants gradually to a lowered temperature, then keep them constantly where it is fairly cold, they will usually adjust themselves. While they grow more slowly and bloom less than in a warmer room, they certainly do better than if the temperature varies widely and irregularly. At least, that is my experience. My problem has been to keep my begonias growing with a minimum of care in the winter and this is the way I have solved it. If there had not been a fuel shortage, I probably would never have learned how well most begonias tolerate low temperatures."

Cultural Requirements

"The majority of my plants can be treated alike. They take an acid soil, rich in humus, but light and rather porous, and, except for the desert types, an abundance of moisture at intervals. Almost all resent drafts and sudden changes of temperature. Only a few like direct sun; the beefsteak begonia (*B. Feastii*), is one and another is *B. Templinii,* a begonia that almost anyone can grow under ordinary household conditions. (I have a four-foot specimen of it myself.) A half-dozen others, besides my semperflorens varieties, live on the sunny side of the room. These are easy to manage, but some of the begonias do present different problems. *B. Feastii,* for example, likes a heavier soil, containing more clay. The desert varieties, such as *B. zenosa* from Brazil and *B. incana* from Mexico, insist upon less water than the others and also require a much lighter soil. They are also difficult to propagate."

Starting Begonias from Cuttings

"I use a goldfish aquarium, 14x24x14 inches high, fitted with a tight glass lid and located in the sunniest spot in the room. On the bottom is an inch of crushed rock, then 1 inch of sphagnum to support the sand, and a top layer of 3 inches of builder's sand. The 8 to 9 inches of air space is sufficient until the new plants are ready to be potted. If the sand is properly moistened and the lid tight, the cuttings need practically no attention. To keep molds from developing and injuring the plants, I put a few mothballs in a small tray. Rex begonias, also the beefsteak begonia and imperialis, are propagated by inserting a triangular piece of the leaf upright in the sand. Rex may also be propagated by laying a leaf flat down on the sand. Most of the others require stem cuttings, a piece of a branch with a leaf (or part of a leaf) attached being inserted in the sand. I often make the hole for the stem with the blunt end of a pencil, then press the sand firmly against the base of the cutting, perhaps an inch or an inch and a half deep in the sand.

"For propagating in summer I use a deep flat filled with builder's sand and plunged in the ground in a moist sheltered spot with plenty of north light."

Care of the Plants in Summer

"Most of my plants go outdoors in the summertime; some in the shade on the porch. I tried several spots in my garden and finally put them north of a quince tree, using a lath shelter for full protection against direct sun. I plunged the pots in the soil, which was a heavy clay, and they all perked up immediately. I hosed them well every night that I was home, and they liked it. Even the difficult ones came through the summer successfully. Most of them lost their leaves when they were brought indoors in the fall, but they all grew out again. Except for my few semperflorens varieties, I never cut my begonias back in the fall. I just let them keep on growing."

* * *

Mr. Miller confesses having two ideas in mind as he increases his collection: to obtain as great a variety as possible in shape of plants, texture, form and coloring of leaves, and appearance of flowers, and to obtain as many different geographical types as possible. He has prepared a list of what he considers his outstanding varieties in these categories. For three cents to cover postage (two cents in Manhattan and the Bronx), the New York Botanical Garden will mail a copy of Mr. Miller's list to those requesting it.

Notes, News, and Comment

Members' Day. Sketches and photographs made by Dr. H. W. Rickett while he was in Mexico last summer for the Committee for Inter-American Artistic and Intellectual Relations were shown during the Members' Day program at which he was the speaker Feb. 2. Mexican plants, particularly succulents and begonias, were among the specimens brought from the greenhouses for exhibit. Many orchids were included in the afternoon's horticultural display. In his talk, Dr. Rickett told of the areas of Mexico that were still virtually unexplored botanically, areas, he said, that should yield many species of plants of horticultural value.

A member of the Garden, Mrs. John C. Stilwell of Mt. Vernon, brought for exhibit a fern that she had kept growing luxuriantly for several years in a pot provided with a wick which draws chemically infused water toward the roots.

Each member who attended the program of Feb. 2 was presented with a small potted geranium propagated from the Garden's large collection of *Pelargonium* varieties.

The speaker for Members' Day on March 1 will be Rutherford Platt, who will show some new kodachromes of seedpods which he has made during the fall and winter.

Portraits of Botanists. For the opening of an exhibit at the Grolier Club in New York, showing portraits of botanists and of plants which have been named for them, Dr. William J. Robbins was invited to give the principal address on Dec. 14. The exhibit, entitled "Great Names and Subjects in the History of Botany and Horticulture," was arranged through the co-operation of the Garden Club of America. A large number of the portraits of the plants concerned, as well as some of the men, were provided by the New York Botanical Garden. Most of the portraits of the botanists and horticulturists came from the private collection of Mrs. Roy Arthur Hunt of Pittsburgh.

In Dr. Robbins' address, which was published in the February Bulletin of the Garden Club of America, he revealed some little known details from the lives of the Tradescants, John Evelyn, Gaspard Bauhin, Philip Miller, John Fothergill, Sir John Hill, John Stuart (Earl of Bute), James Edward Smith, François André Michaux, and others.

Fruit Culture. Tickets for the two lectures on the culture of fruits in the home garden, to be presented at the conclusion of the four lectures on vegetable gardening being given on Thursdays in the New York Times Hall, will be issued free upon application to Dorothy Jenkins, Garden Editor, New York Times, 229 West 43rd St., New York 18. Arthur King will speak Feb. 24 on tree fruits and Edwin Beckett the following week on bush fruits and berries. Both lectures will be given at 8:00 p.m. The New York Botanical Garden is co-operating with the New York Times in offering this free course of lectures on gardening. A discussion period follows each talk.

Addisonia. Circulars are being mailed announcing that the twenty-one completed volumes of *Addisonia,* dating from 1916, are being offered for sale by the New York Botanical Garden for $75. The established price is $10 a volume, each volume consisting of four numbers with a total of 32 colored plates accompanied by descriptions of plants of unusual interest. *Addisonia* is the only publication of its kind in America.

A.A.A.S. Dr. William J. Robbins has been elected a member of the Council of the American Association for the Advancement of Science. Chosen at the same time was Dr. George B. Pegram, Professor of Physics and Dean of the Graduate School at Columbia University.

Visitors. Marcel Raymond of the Montreal Botanical Garden is spending a month in New York to study means of identification for plants under cultivation and methods of publicity at the New York Botanical Garden.

Dr. William J. Bonisteel, home for a brief visit during the holidays, stopped at the Garden just before Christmas. He expected to return immediately to his work in the production of drug plants in tropical America.

Dr. F. R. Fosberg, who is in charge of the search for cinchona in Colombia, spent Jan. 11 at the Garden.

Other midwinter visitors have been Frans Verdoorn, Waltham, Mass.; L. J. Brass, American Museum of Natural History; H. K. Svenson, Brooklyn Botanic Garden; Mrs. Antoinette Miele Wilkinson, Cornell; Helen Mittlachen, Wheaton College; and John Caulfield, of Bowdoin.

Grenville L. Winthrop. Word has just been received at the Garden of the death in January 1943 of Grenville L. Winthrop of New York City. In point of years of continuous support, Mr. Winthrop was one of the oldest members of the New York Botanical Garden, his annual membership having begun in 1896.

Caroline L. Iselin. A member of the New York Botanical Garden since 1924, Mrs. John H. (Caroline L.) Iselin died Oct. 2. She was a resident of Riverdale in New York City.

Groups. Twenty-eight students from the College of New Rochelle, under Prof. J. Carolyn Ferris, visited the Main Conservatories Jan. 15. Ten students from Adelphi College, Garden City, made a similar trip a month earlier.

Lectures. Dr. Roberta Ma spoke on "Flowers and Gardens of China" before the Little Gardens Club of Greenwich Village Jan. 3. G. L. Wittrock addressed the Plainfield Garden Club Jan. 12 on "Food Plants of the American Indian." Dr. H. W. Rickett spoke at the Arboretum of the Barnes Foundation at Merion, Pa., Dec. 7 on "Gardens of Ancient Egypt."

Conference. Arthur Cronquist was the speaker at the monthly conference of the scientific staff and registered students of the Garden Jan. 21, his subject being "Taxonomy of the Genus *Erigeron*."

Succulent Booklet. A new edition of "Succulent Plants of New and Old World Deserts" by E. J. Alexander is appearing this month. The first edition of 1,500 copies, published in June 1942, has been exhausted for several months, and the demand for this 64-page, illustrated booklet has continued steadily. Based on a series of articles published in the Journal, the booklet treats 350 species and varieties of cacti, other New World succulent plants, and Old World succulents, including the stone and windowed plants of South Africa. One hundred are illustrated, and directions for culture are given.

Vice-Chairman. The Board of Directors of the Horticultural Society of New York unanimously elected Dr. William J. Robbins Vice-chairman for the year at a meeting Jan. 12. He was also appointed to the Executive Committee. The Chairman of the Board is Richardson Wright, who is a member of the Corporation of the New York Botanical Garden. The President of the society is Henry F. du Pont, a member of the Garden's Board of Managers, and the Treasurer is Frederick T. Bonham, an annual member of the Garden.

Torrey Club. Dr. Fred J. Seaver was elected First Vice-president of the Torrey Botanical Club at the annual meeting and banquet Jan. 4. Others named from the Garden's staff are Dr. H. W. Rickett, who continues as Editor; Mrs. Lazella Schwarten as Bibliographer; Dr. B. O. Dodge, delegate to the New York Academy of Sciences; Dr. H. A. Gleason, representative on the Board of the Botanical Garden; and Dr. J. H. Barnhart, one of two representatives on the Council of the American Association for the Advancement of Science. Dr. William J. Robbins, retiring President, was chosen on the program committee. The new President is Dr. Michael Levine of Montefiore Hospital.

Resigned. Alletta Rauch (Mrs. Louis Fredericks), who had worked at the Garden ever since she finished business school in 1927, resigned her position last month in favor of home life. During her nearly 17 years at the institution, she served as secretary to the late Drs. M. A. Howe and P. A. Rydberg, to Dr. A. C. Smith until he left in 1940, and up to Jan. 15 of this year for Drs. A. B. Stout, B. O. Dodge, and H. W. Rickett.

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To reach the Botanical Garden, take the Independent Subway to Bedford Park Blvd. station; use the Bedford Park Blvd. exit and walk east. Or take the Third Avenue Elevated to the Bronx Park or the 200th St. station, or the New York Central to the Botanical Garden station.

THE CORPORATION OF THE NEW YORK BOTANICAL GARDEN

The New York Botanical Garden was incorporated by a special act of the Legislature of the State of New York in 1891. The Act of Incorporation provides, among other things, for a self-perpetuating body of incorporators, who meet annually to elect members of the Board of Managers They also elect new members of their own body, the present roster of which is given below

The Advisory Council consists of 12 or more women who are elected by the Board. By custom, they are also elected to the Corporation. Officers are: Mrs. Robert H. Fife, Chairman; Mrs. Elon Huntington Hooker, First Vice-Chairman; Mrs. William A. Lockwood, Second Vice-Chairman; Mrs. Nelson B. Williams, Recording Secretary; Mrs. Townsend Scudder, Corresponding Secretary; and Mrs. F. Leonard Kellogg, Treasurer.

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

VALUABLE SCIENCE

"Botany I rank with the most valuable sciences, whether we consider its subjects as furnishing the principal subsistence of life to man and beast, delicious varieties for our tables, refreshments from our orchards, the adornments of our flower-borders, shade and perfume of our groves, materials for our buildings, or medicaments for our bodies."

When Thomas Jefferson wrote those words* in the 18th century, the fundamental significance of plants in relation to life was not yet understood. Priestley had barely discovered the power of plants to give off oxygen; the essential relation of photosynthesis to all life was not a recognized concept at the time. Certainly, no one at that period realized, as we do now, that were it not for green plants there could be no animal or human life on the earth.

Nor did anyone know for approximately a century and a half about vitamins and certain amino acids, two groups of chemical substances essential for human life—and both of them derived from plants. Research on them still has a long way to go, as it also has on penicillin, great new curative agent, the sole source of which is a lower plant, a mold.

Plant breeding even was little understood in Jefferson's day. The finer fruits and grains, trees and flowers, that a knowledge of genetics lately has given us were then still in the future. The war work on such important plant crops as quinine, rubber, and the numerous oils and fibers, being performed by botanists today, was undreamed of at the close of the 18th century.

Thomas Jefferson appreciated botany as "most valuable" while the science still was in its infancy, before the most significant aspects of it, so far as human life is concerned, were even conceived. What would he say today?

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* Quoted by Charles A. Browne in "Thomas Jefferson and the Scientific Trends of his Time," published by Chronica Botanica Co., ,and noted on page 69 of this issue of the Journal.

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THE NEW YORK BOTANICAL GARDEN

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Percy Wilson—An Appreciation

By H. A. Gleason

THERE were two Percy Wilsons on the staff of the New York Botanical Garden. Some of us knew only the second, but there are still a few of his colleagues who remember happily the first and who sadly watched his slow but unavoidable change into the Percy Wilson of recent years.

He was still in his teens when he joined the staff of the Botanical Garden, lacking some four months of his twentieth birthday. He had developed an interest in plants while in high school, and had become acquainted with Dr. H. H. Rusby and with one or two other botanists. A handsome young man, tall and dark, he was alert and vigorous. Always full of fun and spirits, he laughed, he whistled, he sang, he cracked jokes; athletic, too, and the star pitcher on the Garden's baseball team. Every one on the staff knew him by his first name and forty years later most of his associates were still calling him Percy.

Occasionally there are persons with a natural interest in plants and a natural aptitude for studying them. Possibly this interest is discovered early and one's education directed toward its extension and perfection; most professional botanists have deliberately trained themselves in their chosen science. In others this interest may lie latent and unsuspected, possibly for years, or long after another profession has been chosen. Once this interest has been liberated, like the genie of Arabian Nights, it dominates their lives ever after. Surely no other explanation can account satisfactorily for the activities of such well known botanists as a certain village postmaster, a druggist, a mining engineer, and a corporation lawyer, whose names do not need mention.

Mr. Wilson seems to have been of a similar type. Employment at a botanical garden uncovered his innate ability and gave it a chance to develop. Botany became not only his profession but also to a great extent his avocation. He had neither the advantages nor the disadvantages of a

college education, but he did learn plants and he learned them with extraordinary rapidity and to a remarkable extent.

Although never professionally concerned with the native plants of the eastern states, he knew them well. Many of the miscellaneous requests for information about the local flora were referred to him for reply. For a time he was actively interested in the field work of the Torrey Botanical Club and served five years as chairman of its field committee. He knew cultivated plants well, provided they were of tropical origin. It was with the extensive flora of the West Indies that his knowledge was widest and deepest. There are some ten thousand kinds of plants in the West Indies and the great majority of them were known to him at sight, whether in flower, in fruit, or merely in leaf.

I had seen many evidences of this skill during my early acquaintance with Mr. Wilson, but never fully appreciated it until 1921. I had then just returned from a collecting expedition in South America, with thousands of specimens of plants all completely unknown to me and, for that matter, equally unknown to him, except the common tropical weeds. I was confronted by the task of naming them and I often turned to him for help or for some useful hint.

"Percy, have you any idea what this plant is?"

He did not stop to study it carefully; he seldom even examined it with a hand-lens. He simply looked at it a moment.

"There's a plant in Trinidad which looks like that. I'll show it to you."

He disappeared into our maze of herbarium cases and a moment later had the Trinidad plant before us. It was invariably either the same plant as mine or just next-door to it. It was a feat of extraordinary memory, a memory based on a remarkable interest in the plants themselves.

During his first years at the Garden Mr. Wilson was a museum aide, and the duties of the museum aides were diverse. They mounted plants, they arranged exhibits, they collected specimens, they did anything and everything about the Museum building. Dr. Britton must have been quick to recognize and to utilize his rapidly expanding ability and assigned him tasks where his interest would not only be useful but would also be further developed. At the age of twenty he was sent on a collecting expedition to Georgia, in company with Roland M. Harper.

There is no record of his accomplishments on this first trip, but they must have been highly satisfactory to the Director, for only the next year he was attached to the Total Eclipse Expedition and sent to the East Indies. He had certain non-botanical duties to perform in connection with the astronomical work of the expedition, but he was provided with letters to government officials and to the directors of the botanical gardens at Singapore and Buitenzorg and was commissioned to procure botanical material for the museum of the New York Botanical Garden. This was a heavy assignment for a young man of twenty-one and indicated Dr.

PERCY WILSON

From a snapshot taken in the field some years ago.

Britton's confidence in his ability. He returned some six months later "with ten large cases of museum specimens of economic plants, living orchids, and a collection of botanical books and pamphlets."

Then followed a long series of botanical expeditions into the American

tropics. We may be sure that the series would have terminated early if the results had not met the expectations of Dr. Britton.

In 1902 he went to Puerto Rico, collected there six weeks, and returned with three thousand specimens. In 1903 he spent two months in eastern Honduras, but was forced by a local revolution to return early. In the autumn of the same year he visited Puerto Rico again for a month in company with Dr. Britton and Mrs. Britton. In the spring of 1904 he and Dr. J. K. Small collected in subtropical Florida.

Shortly after his return from this trip he resigned his position at the Garden, with the full approval and encouragement of Dr. Britton, to become assistant botanist at the Estación Agronómica de Cuba. Here he was employed for a year, gaining a wide acquaintance with the Cuban flora and improving his knowledge of Spanish.

Upon his return to the Botanical Garden in 1905 he was appointed Administrative Assistant; in 1910 he was given the additional title of Docent; in 1911 he became Assistant Curator and Docent; in 1914 he was promoted to the rank of Associate Curator and continued in that capacity until his retirement in 1939. From 1905 until the retirement of Dr. Britton in 1929 his duties were chiefly those of a personal assistant to Dr. Britton in his research and during the next five years he was officially delegated by the Board of Managers as Dr. Britton's assistant.

These duties did not prevent him from making other trips to the tropics. He worked in the Bahamas in 1907 and 1909 and visited Cuba for extensive collecting in 1910, 1911, and 1916.

Success in field work required physical vigor, energy, and a keen knowledge of plants, but these qualifications were only one phase of his ability. He soon learned the methods of taxonomic research under the tutelage of such men as Britton, Small, and Rydberg, and as early as 1904, at the age of twenty-five, he was assigned to the study of certain collections from Panama and his own collections from Honduras. Shortly after his return from Cuba he completed a study of the small family Altingiaceae for publication in North American Flora and was at once assigned to similar work on the much larger and more difficult family Rutaceae. Still other groups of plants were taken up for monographic study in later years, but most of his subsequent research was devoted to the flora of the West Indies in general and to that of Cuba and Puerto Rico in particular, always in close co-operation with Dr. Britton. The results appeared in numerous short papers, under the authorship sometimes of the one, sometimes the other, and sometimes the two together. Some hundreds of species were first made known to science by them and the Garden's collections illustrating the flora of the West Indies soon became the largest and most important in America, if not in the entire world.

This work culminated in the publication of the "Flora of Porto Rico and the Virgin Islands," by Britton and Wilson, the first part appearing in

1923 and the last in 1930. In this extensive work, comprising more than two thousand species, the preparation of keys, the co-ordination of earlier work and the listing of synonyms, and the writing of the descriptions were largely done by Mr. Wilson, subject to review and approval by Dr. Britton.

The compilation of a flora of Cuba was primarily the task of Mr. Wilson personally. For several years a part of his time was devoted to it and after the completion of the Flora of Porto Rico it became his chief work. He based his list naturally on the large collections of Cuban plants in the herbarium of the New York Botanical Garden, many of them made by himself, but also collated and evaluated the voluminous and widely scattered literature on the subject, extending back to the earliest days of botanical work in the island. Critical material was borrowed from other herbaria, especially from Stockholm, representing recent work by Ekman, and from the Gray Herbarium of Harvard University, where the old collections of Charles Wright were available. Although essentially ready to print at the time of Mr. Wilson's retirement, difficulties of publication arose and the catalog is still in manuscript form. It remains, nevertheless, the most complete exposition of the flora of Cuba and will form a sound basis for any future work.

The magnitude and importance of Dr. Britton's work in taxonomy is well known and surprise has often been expressed that he could accomplish so much while also engaged in the numerous administrative duties of the directorship of the Botanical Garden. There is no doubt that this productivity was made possible through the able, efficient, patient, and persevering assistance which he received from Mr. Wilson.

Even his chief avocation was botanical in nature. Many years ago he began the formation of a collection of seeds. His spare time, his holidays, and his vacations were largely used in gathering seeds personally. By exchange, by extensive correspondence, and even by purchase he added to this collection until it reached an imposing size. Shortly after his retirement he presented it to the New York Botanical Garden, where it forms a valuable and highly useful part of its collections.

Heretofore we have referred almost exclusively to the work of the first Percy Wilson. A brief word about the second is necessary. About twenty years ago he was stricken with a baffling and undiagnosed disease. Although for a time his life hung in the balance, he recovered sufficiently to return to work, unshaken in spirit and industry but weakened in body. Then began a long and gradual decline in his health which saddened his life, grieved his colleagues, and reduced his accomplishment. Patiently and wearily he returned to his desk day after day and year after year until his retirement in 1939. His gradual decline continued another five years, until it finally resulted in his death February 6, 1944, in the sixty-fifth year of his age. The New York Botanical Garden will rarely have another employee equally industrious, faithful, and conscientious.

Bread

By Christine Chapman Robbins

"HE is rich enough who doesn't want for bread" was written by St. Jerome in his Letters about 388 A. D. He was writing at a time when bread and food were synonymous; in fact, in the Old Testament we find the terms used interchangeably. Evidently in Biblical times bread —that is, loaves or cakes made from wheat or barley—played a very prominent part in the diet of the people. The methods of preparing flour in those days were crude. The pestle and mortar were used to beat or bruise the grain into a coarse sort of flour, and the quern or handmill with its upper and nether millstones was used for the finer varieties, which were prepared by repeated grindings or by sifting with sieves. It was such fine meal as this to which Abraham refers in "take three measures of fine meal, knead it and make cakes." In Solomon's household, "the day's provision was 30 measures of fine flour and 3 score measures of meal." The loss of the handmill, the family's most important tool, was a calamity in life that was recognized by the early legislators; in the Deuteronomic Laws there is the provision: "No man shall take the mill or the upper millstone to pledge;" for in so doing "he taketh a man's life to pledge."

In ancient Egypt white bread made from wheat was used in the King's household, for ritual offerings, for honored guests, and by the wealthier classes. It was, doubtless, not fine flour as we know it, but merely a more finely ground meal. It did, however, set up a class distinction, as barley was known as the poor man's grain. Barley is low in the nitrogenous matter we call gluten, which is abundant in wheat. Because leavened or yeast bread could not be made without gluten, the barley loaves of the Bible were unleavened flat cakes.

An interesting bas-relief on the tomb of a Roman miller and baker named Eurysaces, who lived early in the first century, depicts the various processes in the preparation of the flour and the baking of the loaves. The mill was driven by ass or mule power; men called bolters are shown sieving out the bran from the flour by hand, and the bakers are depicted moulding the loaves on a board.

Bread is still a most important item in our diet, not only because it is a good food but because it is much cheaper than meat. Cereal grains make up between 80 and 90 percent of the energy value of the rural diet in central and southeastern Europe, 53 per cent in France, 40 per cent in western

and northern Europe, and between 38 and 40 per cent in the United States. We still prefer bread made of wheat as compared to that made of other cereal grains, chiefly because wheat is the only grain which contains enough of that elastic protein material, gluten, to permit the dough to rise and produce the lightness and fine texture we like in our baked bread. Some idea of the preëminence of wheat may be gathered from the following figures on the various grains consumed in flour and grain mill products in the United States in 1939:

Wheat	508,053,667 bu.	Barley	5,645,124 bu.
Corn	62,254,528 "	Buckwheat	783,575 "
Oats	8,846,555 "	Rice and other grains	959,553 "
Rye	7,703,000 "	Soybeans (whole)	26,388,970 lbs.

The Development of Patent Flour

The cereal standing next to wheat in gluten content is rye, and this grain has been widely used in the Scandinavian countries, Russia, and Germany as a source of flour for leavened bread, while from the unbolted flour (bolting refers to sifting through a cloth) black bread is made, baked in large square loaves either without leaven or leavened by bacterial action only. The term "black bread" has come to connote the food of the European peasant, the gentry dining on finer fare, and, unless one has grown up with it, black bread with its heavy texture and sourish flavor contrasts unfavorably with the light and tasty loaf of white bread.

And yet, strange as it may seem, the black bread of the peasant is more nutritious and more healthful than the white bread of the gentry. This is because in the preparation of the flour for making white bread some of the minerals, vitamins, and perhaps other substances important in nutrition are removed.

For many years the miller's objective was to turn out a flour of whiter, brighter appearance which would keep well and which would bake into a well rounded, fine-textured loaf, light for its size. To accomplish this certain portions of the wheat grain had to be removed in the milling process. The germ or embryo is high in fat as well as vitamins and the keeping quality of flour is increased by its removal, which is not difficult in roller milling since, being tough in texture, it is flattened rather than crushed by the rolls and is thus easily separated from the rest of the grain. The bran, rich in minerals and containing some protein, was eliminated because it discolored the flour and interfered with the fine texture of the loaf.

It is probable that the screening of the flour in earlier days was not very complete (the term "wheaten meal" was used for wheat flour in Great Britain as late as the early 17th century) and doubtless enough of the bran and wheat germ were retained in the flour to give all peoples, peasant and gentry, poor and rich, a more nutritious flour than the fine white flour we have today. Stone-ground wheat flour of our grandmothers retained 60 per-

cent of the original thiamine (vitamin B_1); white flour produced by the roller process of today has but from 6 to 16 per cent.

The 1926 edition of the Encyclopedia Britannica has little to say on the nutritional value of flour, but devotes most of its attention to improved methods of making a flour of fine white color, of high strength and percentage of gluten (that is, a flour which would use well and form a light fine-textured loaf). "Bran," says this edition of the Encyclopedia, "is only fit for feeding beasts and the final product of the milling process is now happily free from such impurities."

The kinds of bread are almost infinite and are often characteristic of certain countries or localities—Vienna bread, Italian bread, French bread, pumpernickel, rye bread, salt rising bread, Boston brown bread, corn bread, tortillas, black bread, hot biscuits, beaten biscuits, hoe cake, potato bread and so on. Yet with all this infinite variety, bread to the average American means a loaf made from white bleached patent flour.

Enriched Flour

That the white bread commonly used is low in vitamins and in some minerals has been known for the past 20 or 25 years, though the public has not appreciated the fact. But as long as meat, dairy products and vegetables were plentiful and comparatively cheap these supplemented the deficiencies of the bread. At the outbreak of war, meat consumption was radically curtailed and all dairy products were less readily available; therefore, means were sought to improve the national nutrition. In 1941 millers were authorized to enrich their patent flour; that is, to add to it small amounts of minerals, salts and pure vitamins, thus returning it so far as these constituents are concerned more nearly to the conditions of the original wheat grain. The American and English governments allow white patent flour to be labeled "enriched" if thiamine (vitamin B_1), niacin and iron have been added. The immediate demand for these vitamins on the part of the millers was so great that for a few months our available supply of vitamin B_1 was strained to the limit, and in Great Britain the enriching program was delayed until the vitamin supply was deemed adequate to meet the demand upon it. By the spring of 1942, 30 percent of the nation's bread was being enriched, and the 1942 edition of the Encyclopedia Britannica hails this enrichment program as the greatest nutritional development of the war period in the United States and Great Britain.

However, Dr. W. H. Sebrell of the United States Public Health Service claimed in 1942 that the bakers and public were backsliding on the use of enriched flour. The bakers said it increased the cost of the bread, and some of the larger companies have gone back to making plain white bread without extra vitamins or iron. After two years England has largely abandoned the idea of flour enrichment through the addition of synthetic

vitamins, and Canada has declared any flour to which a synthetic vitamin has been added to be adulterated.

The weakness of the enrichment program is not only because of its cost (we go to the trouble of taking out the vitamins in preparing the flour and then pay for putting them back in), but because it resupplies such a limited number of nutritional factors to the patent flour. The losses due to the milling process are considerable. Some 70 to 90 percent of the minerals in wheat are discarded in the bran, and the only one replaced is iron. Similarly, there are other very important vitamins besides thiamine and niacin in wheat and from 50 to 95 percent of these are removed in the preparation of the flour, while only two of them are returned in the enriched flour.

Whole Wheat Bread

Why do we continue to refine flour, remove in part its natural vitamins and minerals and reduce its value as a food? Why don't we use bread made of whole wheat flour?

The chief reason seems to be because most people have a strong ingrained preference for white bread, and in spite of being told day after day that whole wheat bread is more healthful, they do not care to eat it. Then, too, whole wheat bread is likely to mold more quickly than white bread made of enriched flour; it is perhaps less easy to make and, as a rule, it is more expensive than white bread.

During the first World War the use of whole wheat bread was intensively stressed, yet only 2 or 3 percent of the total flour consumed in the United States and Great Britain was whole wheat flour, and during the years that followed this proportion increased but slightly. In the past few years there has been more interest in the use of whole wheat bread and a variety of breads are on the market labeled "whole wheat," "entire wheat," "100 percent whole wheat," "graham" and the like. However, flour labeled "whole wheat" may have from 5 to 10 percent of the bran removed, and cracked wheat bread contains only 3 parts of cracked wheat to 7 of white flour. Care must be taken in reading and interpreting labels if you want a genuinely whole wheat bread. One baking company, which prepares a 100 percent whole wheat bread, has developed a $500,000 business in the past 5 years and is distributing 2,000,000 loaves a year at a deluxe price—but that is only a minute part of the bread eaten in this country.

Bread-Making at Home

Bread-making at home has gone out of fashion. About 95 percent of the baked goods consumed in cities is made outside the home, and in rural areas the percentage is 57 per cent and going up. Even those who bake their own bread are not inclined to use whole wheat flour. In 1939 only one-sixth of the housewives making the family bread bought whole

wheat flour. The reasons commonly given for not using whole wheat flour are (1) whole wheat flour does not keep well and in rural sections where most of the home baked bread is made it is often necessary to buy in large quantities; (2) whole wheat bread is difficult to make; (3) whole wheat flour is too expensive; (4) members of the family don't like it.

(1) Unless special precautions are taken, whole wheat flours spoil more readily, largely because of their higher fat content. I find that grocers buy their supply in small quantities. The manager of one of the large chain stores tells me he buys a half dozen three-pound sacks every two weeks, except in the summer when he does not carry it. That would indicate that whole wheat flour is not a best seller, as this same store carries eight or ten brands of enriched flour in 25-pound sacks at all times.

(2) Whether made from hard or soft wheat, whole wheat flour has less baking strength than white flour; therefore, whole wheat bread is more difficult to make than white bread.

(3) Some contend that if we hope to increase the use of whole wheat flours and breads we must lower the price, even by subsidy if necessary. Whole wheat flour costs from 10 to 12 cents per pound, enriched flour 5 cents per pound, and patent flour 4 cents per pound.

(4) Many people do not like the flavor of whole wheat bread, which is distinctive. I have asked many convalescents in hospitals who demanded white bread why they do not like the whole wheat and the usual answer is that it has no flavor.

Amino Acids in Wheat

If by propaganda, by subsidies, or by education, the general population could be brought to eat whole wheat bread, the effects on national health would be notable. But even whole wheat bread is not a complete food because we require in our food a number of nitrogen-containing acids, the amino acids, which we cannot construct in our bodies any more than we can make thiamine or niacin. One of these essential amino acids, lysine, is found only in small quantities in wheat, and there may be others which are present in too small quantities to give us our optimum requirements. No matter how many vitamins or how many minerals are supplied in our diet, if any one of ten nutritionally-essential amino acids is insufficient, growth is interfered with and normal well-being is upset. It would not be possible to live indefinitely on a diet limited to bread and water, even if the bread were whole wheat bread.

Lysine, however, occurs in reasonable amounts in soybeans and peanuts; in fact, soybean proteins are said to compare favorably in completeness of amino acids with any other single source of edible protein. Soybeans are also rich in fat, vitamins and minerals. But the protein in the soybean is not glutenous and soy flour cannot by itself be used to make bread. It is, however, almost ideal as a supplement for wheat flour, and if bread is

made from 85 percent whole wheat flour and 15 percent soy flour it becomes an almost complete food.

Soybeans as a Supplement for Wheat Flour

Some idea of the differences between the mineral and vitamin content of bread made from refined flour and that made from whole wheat, or from whole wheat supplemented with soy flour, may be gained from the following statement based on figures derived from the National Research Council and the Agricultural Chemistry Research Division of the United States Department of Agriculture. *A pound a day of bread made of* 80 *percent whole wheat and* 20 *percent soy flour would supply a man with enough phosphorus, iron, vitamin* B_1 *and niacin, but he would have to eat five pounds of bread made from plain patent flour to get enough thiamine, or three pounds to get sufficient iron, phosphorus and niacin.*

The importance of the proteins of soybeans as a supplement for those in wheat in animal nutrition is clearly shown by the results of the feeding of rats as reported by the Protein and Nutritional Research Division of the United States Department of Agriculture. When rats were limited to the proteins of patent wheat flour they gained but 19 grams in weight in 42 days; with whole wheat flour the gain was nearly twice as much, 36 grams; a mixture of 95 percent patent flour and 5 percent soy flour was slightly more satisfactory than whole wheat (39 grams); but when the rats were fed 85 percent whole wheat and 15 percent soy flour, they gained 93 grams.

All the evidence shows, then, that bread made of patent wheat flour is deficient in vitamins, minerals, and certain important constituents of proteins. Bread made of whole wheat is superior because of its higher vitamin and mineral content, but still deficient in some of the nutritionally-essential amino acids. Bread made of a mixture of 85 percent whole wheat and 15 percent soy flour approaches a complete food.

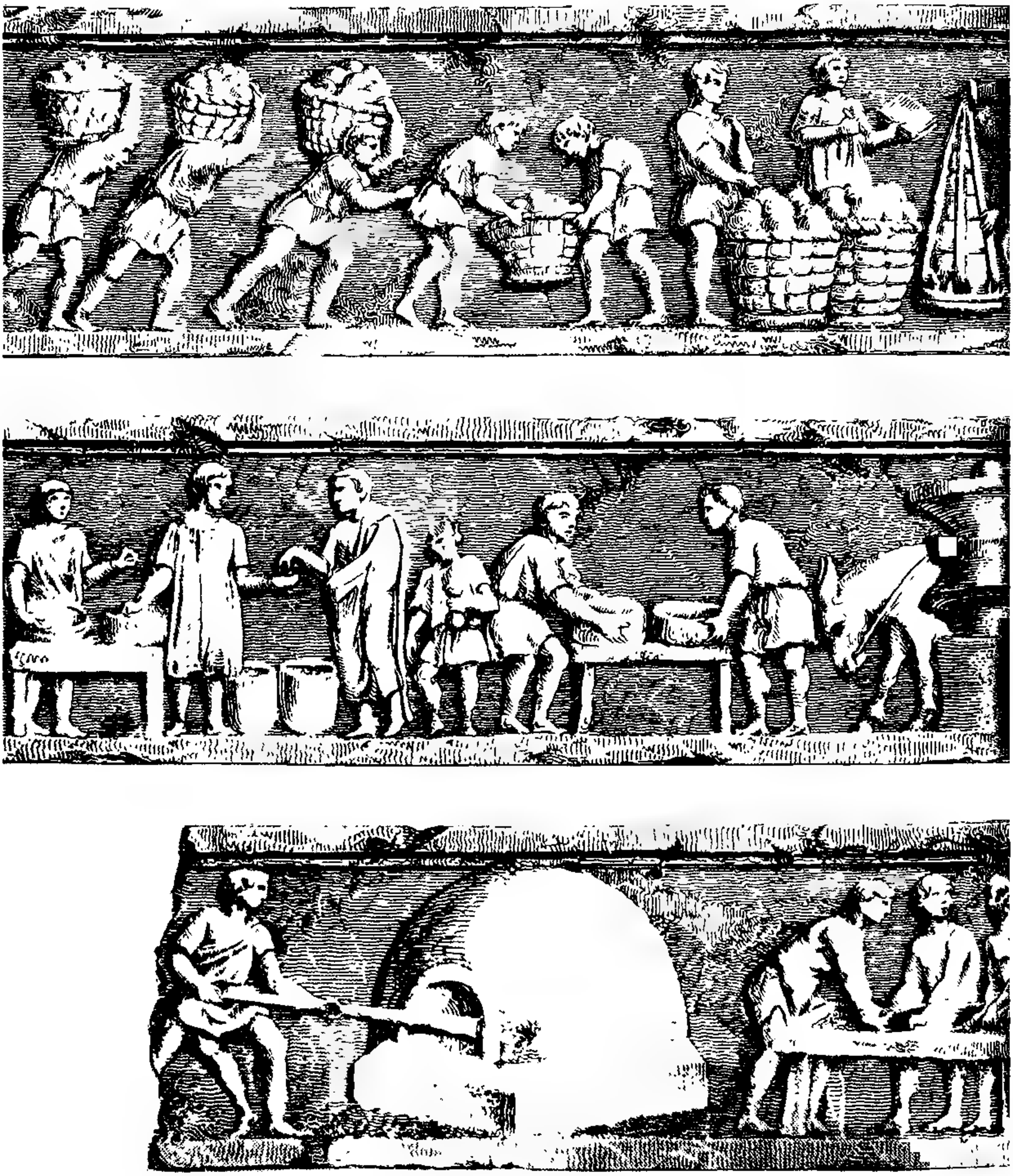
Home-made Bread of Whole Wheat and Soybeans

It seems clear, therefore, that we have the knowledge; what we need is to translate it into practical terms. How can the average consumer obtain a nutritionally better bread with a pleasing texture and flavor at reduced cost? This question has interested me for some time and this is one way in which it can be answered.

We decided to make the flour ourselves. This eliminated the problem of spoilage because the wheat grain and the unground soybean keep well. It also reduced the cost because whole wheat and soybeans can be bought for much less per pound than comparable flours. We bought a small hand flour mill for $3.75. An electric mill would be more convenient but more expensive, and none is available on the market at present. The wheat we used came from a farm in Pennsylvania and is of the soft wheat type. We

BAS RELIEF FROM THE FUNERAL MONUMENT OF

In Rome Near Porta Maggiore

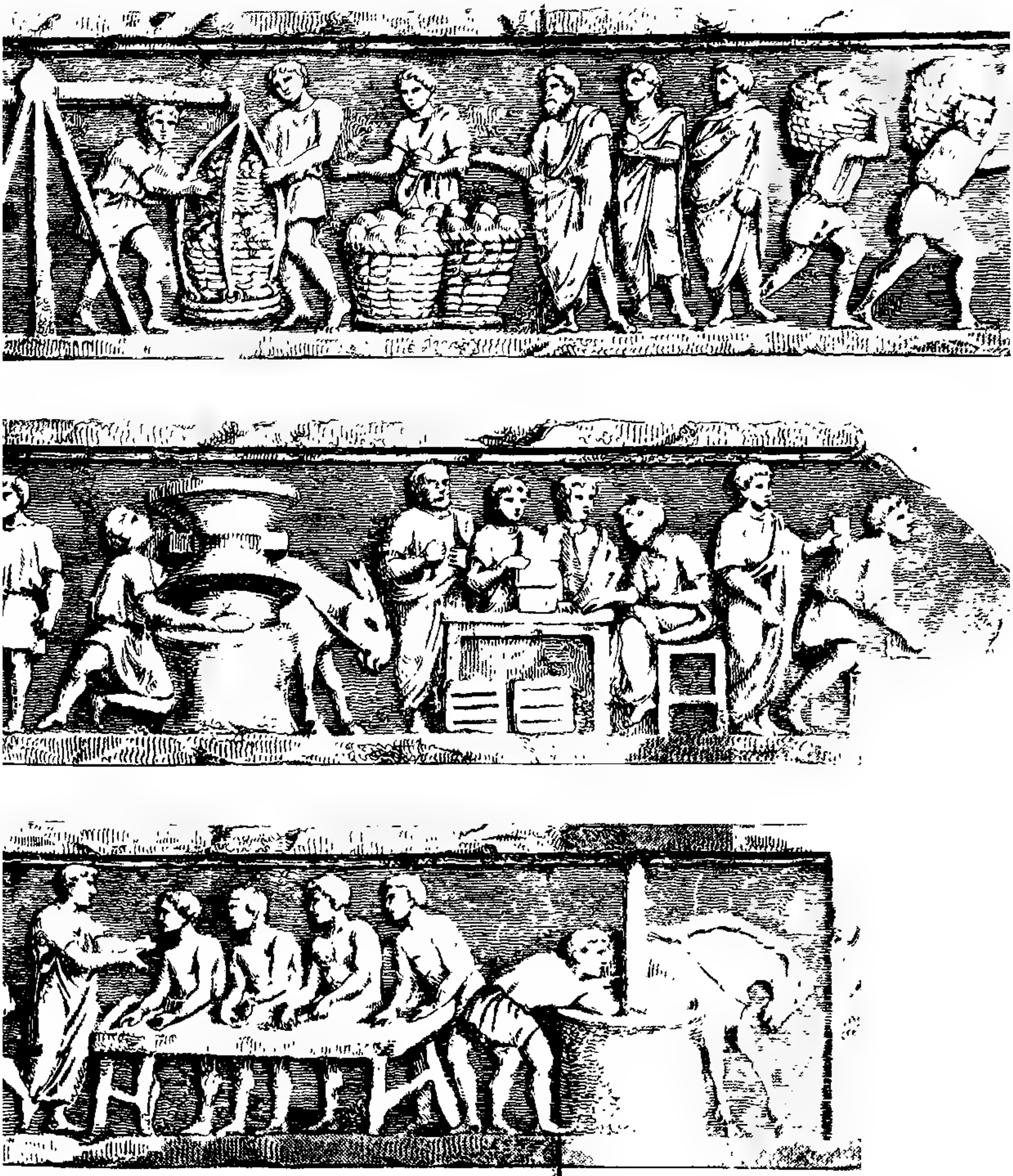


Upper Line: Bread is being weighed and delivered to the magistrates.

Middle Line—left to right: Grain is brought in and is being paid for. Grain is being washed. Grain is being ground, the mills being driven by ass or mule power; in the

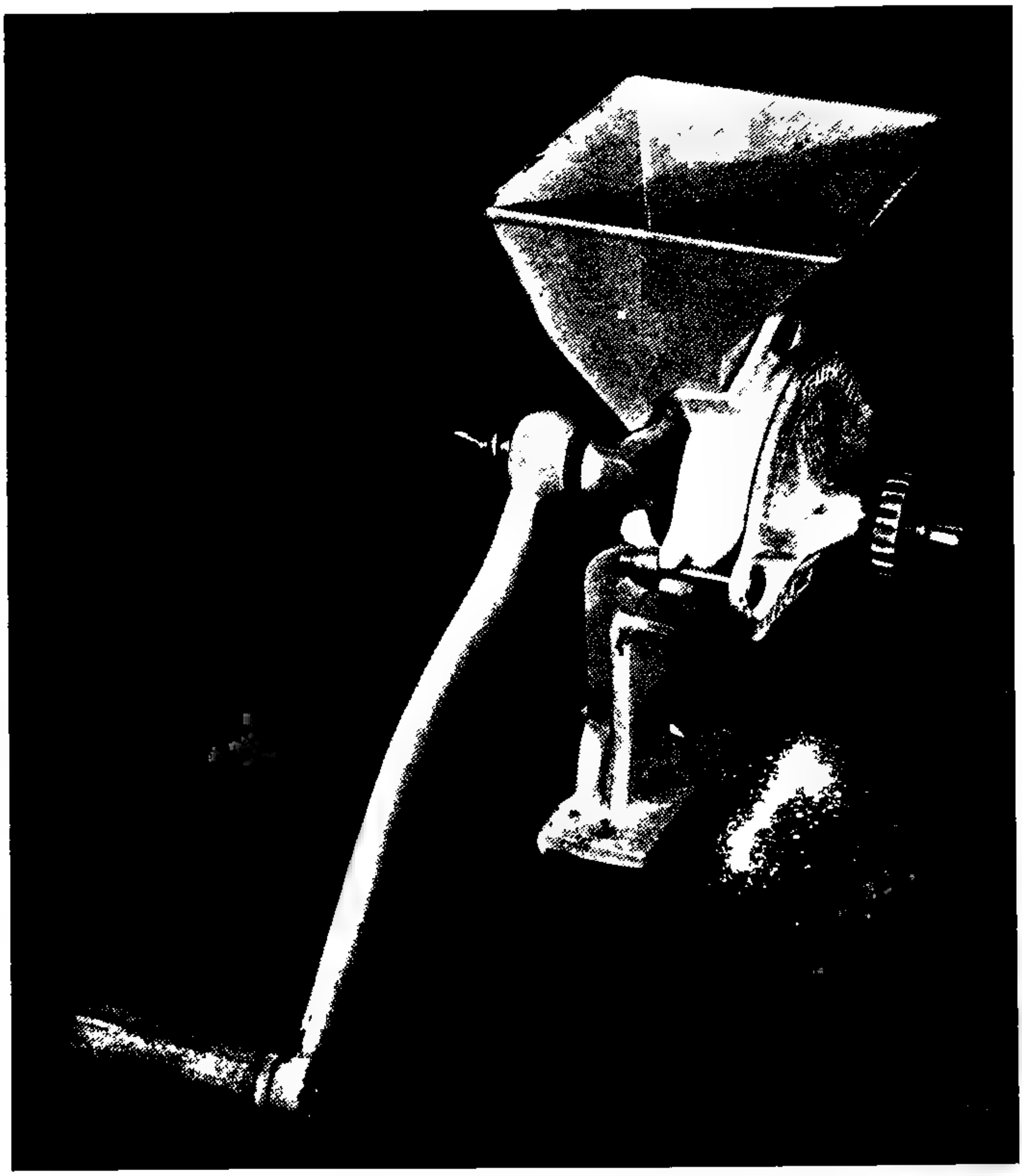
MARCUS VERGILIUS EURYSACES

(*Courtesy of the Metropolitan Museum of Art*)



second mill the ground grain is being collected. Sifters are sieving bran from the flour by hand.

Lower Line—right to left: Bread is kneaded, evidently with horse power. Bakers roll loaves on boards. Oven is being charged by means of a shovel or peel.



A simple hand flour mill.

have used two varieties of soybeans, one black-hulled, more oily and softer, from Illinois; the other yellow and harder, bought in Chinatown. The flour is ground reasonably fine (the grinder can be adjusted) and it takes about 10 minutes to prepare enough flour for two loaves of bread.

The problem of a desirable and nutritious bread was solved, at least for us, by making the bread according to the following recipe, which is sufficient for two loaves.

Recipe for Whole Wheat-Soybean Bread

2¼ cups whole milk, scalded and cooled until lukewarm
1½ cakes compressed yeast, dissolved in ¼ cup lukewarm water or milk (previously scalded)
2½ teaspoons salt
2 tablespoons lard or Crisco
2 tablespoons molasses
2 tablespoons sugar
1 tablespoon honey
4½ cups ground wheat flour
¾ cup ground soybean flour
2 cups enriched flour (Pillsbury or Gold Medal flour)—add ¼ cup white flour if necessary.

The procedure followed is not unique. The sugar, molasses, honey, fat, and dissolved yeast are added to the lukewarm milk. The yeast should be fresh and active. To test it I occasionally add ½ teaspoon of sugar to the water in which it is dissolved and allow it to stand for five minutes. At the end of that time, live active yeast should show bubbles.

The ground wheat flour used is not sifted. I stir it to lighten it and break up any particles adhering together and then measure it. The soybean flour is stirred and measured in the same way and added to the ground wheat flour. The enriched white flour is thoroughly sifted before measuring and 1½ cups are added to the ground wheat and soybean mixture; another ¾ cup is held back to be added later.

The prepared flour mixture is added gradually to the liquid. It could be mixed with a mechanical beater but I beat in about half the flour with a rotary egg beater to make a smooth batter and continue mixing with a wooden spoon until the flour mixture is worked in. If the batter is still too soft and sticky to handle, I gradually add the flour held back for this purpose—½ to ¾ cup should be enough.

When a soft ball can be formed, the dough is ready for kneading on a board. It will seem sticky at first and may cling to the fingers, but as it is kneaded, the stickiness should disappear. The process of kneading should be thorough but the pressure should be light and the time can be less than that required for white bread.

The dough is sufficiently kneaded when it forms a soft elastic ball (the dough will spring back when pressed with the finger). It can then be handled with practically no flour on the board.

The dough should be set to rise at about 80°-85° F. I like to rub a little grease on the surface to keep it soft and elastic while it is rising. The temperature is a problem this winter, and it is necessary to hunt a warm spot in the house out of drafts (but not directly on a hot stove or radiator) and set the bowl of dough in a larger container of water about as warm as the hand will stand. I always start the bread in the morning to be able to watch it carefully. When it becomes 1½ times its original bulk it should be tested frequently. If it still springs back when lightly touched, allow it

to continue rising. If the imprint of the finger is retained, fermentation has proceeded far enough (too much expansion cannot be tolerated by soft flour) and the dough is ready to be molded into loaves.

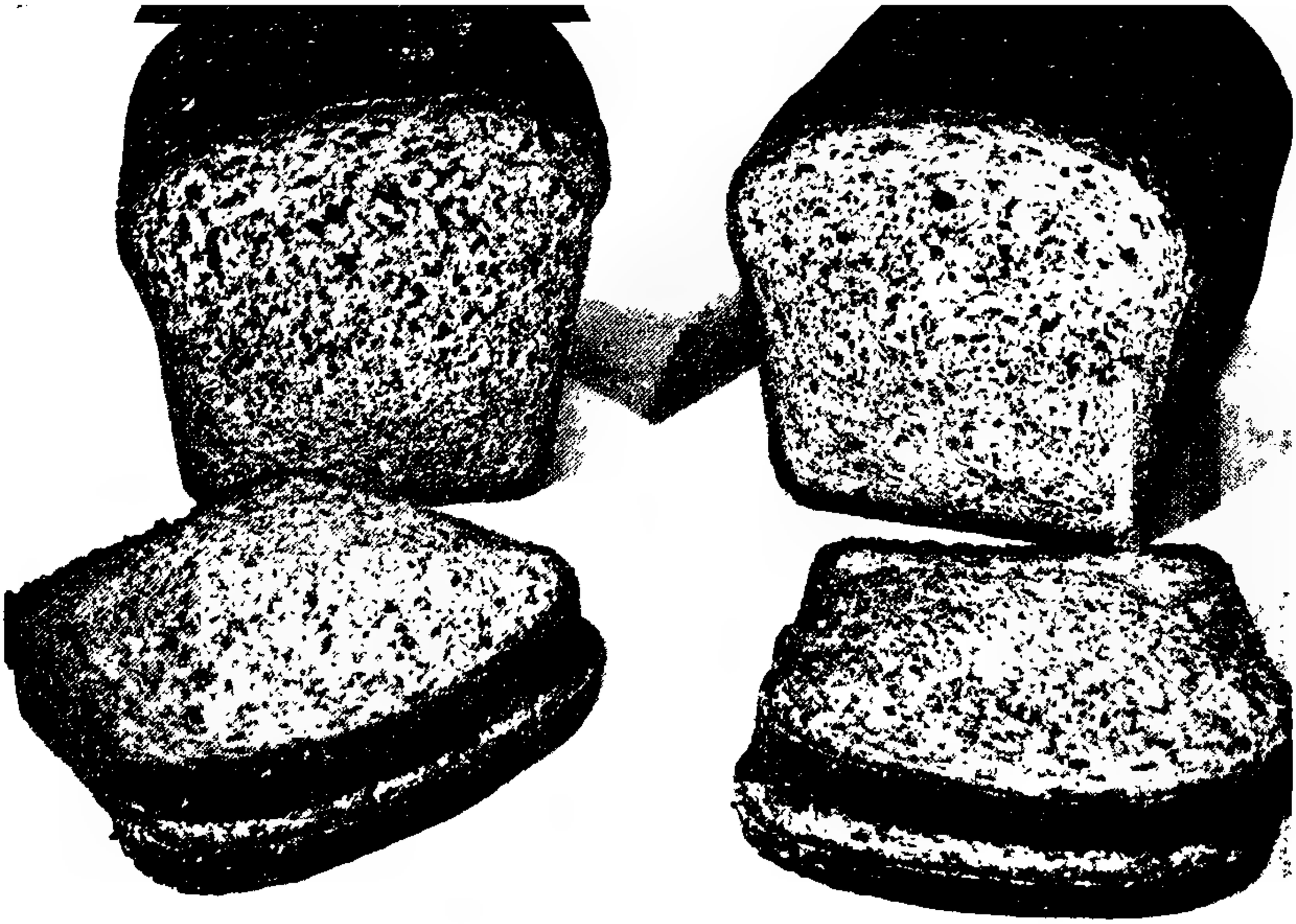
In pressing down the dough, you can hear the bubbles of gas break. This time, it is necessary to continue kneading only until these bubbles are broken. The dough can then be shaped into loaves and set in pans to rise again at the same temperature. I find individual pans best to use, and I like the 8½ x 4 x 3 inch size. It is important that the pans be large enough to allow the dough to double in bulk. Shortly before they reach that stage these loaves will show air spaces just under the surface. When that occurs, they are ready for baking and must then be handled very carefully. Best baking temperature is 375° for 10-15 minutes, followed by 350° for 40-50 minutes. An hour in all is not too much for large loaves as whole wheat bread requires somewhat longer baking. When done the loaves draw away from the sides of the pan and have a hollow sound when tapped. They often shake a bit in the pan. They should be placed on the side on an open rack to cool. I rub the upper crust with butter to make it shiny and softer, and I find the bread cuts better if wrapped in waxed paper when cool and allowed to stand about 36 hours before using. The entire time for making this bread should not exceed 5½ or 6 hours.

This bread has a pleasant nutty flavor and good texture. It slices well a day or two after making, if a sharp knife is used. It has been said that soybeans give a beany flavor to the bread, but I have never been conscious of that. The combination of molasses, sugar and honey seems to blend particularly well with the whole wheat flour and is probably an important item in determining the flavor of the bread. In addition to its greater nutritional value, this bread appears to have another important characteristic. Some people find that white bread if eaten in any quantity interferes with peristaltic action, induces flatulence, and makes them uncomfortable. The whole wheat-soybean bread eliminates these conditions and can be used as a more substantial part of the diet without discomfort.

The soybean flour in this recipe amounts to 10 percent. I have made bread from 85 percent ground wheat and 15 percent ground soybeans with no white flour added, and with a smaller amount of white flour than that given in the recipe. However, reducing the proportion of white flour results in a smaller loaf with a coarser texture which does not slice as well.

Sylvester Graham's Idea

Recently I found a small book called "Treatise on Bread and Bread Making." The author, Sylvester Graham, published this paper in 1837 to encourage the use of what came to be called by his name, graham flour, or the ground wheat grain. He wrote, "The mystery of bread making is to have the flour sweet and good. Every family might easily own a



Bread made from home-ground wheat and soy beans. The loaf on the right is made from the recipe given on page 63. The one on the left contains about half as much white flour as that given in the recipe.

handmill with which to have at all times freshly ground meal which makes far richer, sweeter bread. With good flour, fresh yeast, a proper temperature and properly kneaded dough good bread, which is one of the most wholesome articles entering into the diet of man, could be a commonplace in every home."

It may seem strange to suggest that we think of returning to procedures practiced or recommended a century or more ago, and yet what was true then would seem to be just as true today. With good materials, a moderate amount of skill and care, bread-making can become a pleasant, not an onerous task. Any person having the patience, knowledge, and skill necessary for gardening can become a good bread-maker. The gardener has already learned the importance of nourishment, temperature, proper timing, good tools and skillful fingers on growing things. These same elements can produce not only vegetables and flowers but the bread which "strengtheneth man's heart" and becomes the staff of his life.

(*For a list of publications dealing with bread, see the following page*)

Recent Literature on Bread

More detailed information on bread and its nutritional values may be obtained from the following publications:

Various Authors. Soybean Food: American Soybean Assoc.—22nd Annual Convention, Purdue University (1942)

MacDougall, E. J. Report on Bread in European Countries: League of Nations Public Health Dept. (1939)

Sherman, Henry C. and Constance Parson. Modern Bread from Viewpoint of Nutrition.

Miller, Cora. Bread and Whole Grain Cereals: New York State College of Agr.—Home Economics War Emergency Bulletin 576 (1943)

Theissen, Emma. Making White and Whole Wheat Bread from Hard Wheat Flour: Wyoming Agricultural Experiment Station Bulletin 242 (1940)

King, Florence. Home-made Bread, Cake and Pastry: U. S. Dept. of Agriculture, Farmer's Bull. 1775 (1942)

SPRING EVENTS AT THE GARDEN

FREE ILLUSTRATED LECTURES

Saturdays at 3 P.M.

Mar. 18 ***"Who Walks With Beauty . . ."***
A Motion Picture in Color
Alice Chauncey

Mar. 25 ***Flowers of New York's Springtime***
E. J. Alexander, Assistant Curator

Apr. 1 ***How Plants Grow and Reproduce***
E. E. Naylor, Assistant Curator

Apr. 8 ***Some Common Insects—Good and Bad***
A Motion Picture in Color
Raimon L. Beard, Conn. Agricultural Experiment Station

Apr. 15 ***Late Spring Work in the Vegetable Garden***
Thomas Little, Superintendent, Estate of Col. Robert H. Montgomery

Apr. 22 ***New York State's Parks—***
A Motion Picture in Color
C. R. Blakelock, Long Island State Park Commission

Apr. 29 ***Mosses—What They Are, Where They Live, and How They Grow—***
With Kodachrome Illustrations
Frances E. Wynne, Assistant Curator

May 6 ***Lilies for Eastern Gardens***
A. B. Stout, Curator of Education and Laboratories

May 13 ***Keeping Garden Plants Free from Pests***
B. O. Dodge, Plant Pathologist

May 20 ***Through the Year in a Long Island Garden***
Mrs. Charles Doscher

RADIO PROGRAMS

Alternate Fridays, 3:30 *P.M., WNYC* (830 *on the dial*)

Mar. 10 ***Beginning the Beginner's Vegetable Garden—***
With *Edwin Beckett,* Superintendent, Middletown Farm, Red Bank, New Jersey, answering questions of Mrs. Harry Fisher of New Rochelle.

Mar. 24 ***Beneficial Insects in the Garden—***
Edwin Way Teale, Author of "Grass Root Jungles," "The Golden Throng," and other books.

Apr. 7 ***Keeping the New Garden Growing and Producing—***
With *James G. Esson,* Editor, Gardeners' Chronicle of America, answering questions of Mrs. J. C. Nurnberg of Mt. Vernon.

Apr. 21 ***Springtime Walks in the Vicinity of New York—***
John A. Small, Professor of Botany, New Jersey College for Women, and Chairman of Field Trips, Torrey Botanical Club.

May 5 ***A Thousand Years of Coffee History—***
William H. Ukers, Editor, Tea and Coffee Trade Journal.

May 19 ***Home Grown Flowers the Year Around—***
An Amateur's Experience with a Greenhouse. *John H. Myers,* White Plains, N. Y.

June 2 ***Ancient Dyes That Come From Plants***
William F. Leggett, Associate Editor, The Textile Colorist.

June 16 ***Summer Care of the Vegetable Garden—***
James S. Jack, Head Gardener, Estate of Mrs. Flagler Matthews, Rye, N. Y.

June 30 ***Molds and Mildews in the House—***
Fred J. Seaver, Head Curator, New York Botanical Garden.

EDUCATIONAL PROGRAM

ALL-DAY SHORT COURSES FOR GARDENERS

March 27, 28, 29 ***Vegetable Gardening***
April 24, 25, 26 ***Practical Gardening***
June 6 and 7 ***Disease and Pest Control***

WEEKLY CLASSES IN BOTANY AND GARDENING

Botany for Beginners	starting	**Monday, April 10, at 8 p.m.**
Plant Propagation	"	**Saturday, April 15, at 2 p.m.**
Field Botany	"	**Saturday, April 22, at 1 p.m.**
Outdoor Gardening Practice	"	**Thursday, April 27, at 7 p.m.**
Garden Construction	"	**Tuesday, May 2, at 7 p.m.**

BROADCAST

"BRINGING RUBBER BACK TO THE AMERICAS" *was the subject of Charles Morrow Wilson, author of "Trees and Test Tubes" (reviewed in this Journal last month) on the New York Botanical Garden's radio program Feb.* 11 *over* WNYC. *The paragraphs below are taken from his talk on the air.*

ALL of us live in a rubber age. Therefore, each one of us has a right to his own views and estimates about rubber, whether his main interest is centered in rubber tires, rubber dolls or rubber dollars. I should like to say most of my nickel's worth about natural rubber as an enduring and invaluable world crop. We are well aware that we need synthetic rubbers to meet specialized uses which help the rubber industry, our war efforts and our daily lives. But we also need natural rubber in ever greater quantities for the years and the world that are ahead of us.

The case for natural rubber is based on known performance and proved averages, on the fact that more than nine-tenths of all rubber thus far used by man is natural rubber, that natural rubber is long and brilliantly proved as the nearest ideal material for auto and aviation tires and tubes, which combinedly require around three-fourths of all rubber used. We know positively that natural rubber will do this job, and we are still not sure that any of the make-believe or would-be rubbers will provide us consistently good tires now or ever. The main hope in synthetic is now Buna S. But the average record of tires made from Buna S. is even now far from satisfactory.

Natural Rubber Needed

For our own good, maybe for our survival, we will require natural rubber, and I for one think that a reasonable part, eventually a third or more of our natural rubber needs should be grown in the Western Hemisphere. A survey made by our truly great Department of Agriculture indicates that the Hevea rubber tree which is native to Brazil, this rubber tree which has heretofore supplied more than nine-tenths of all rubber used by mankind, can be grown as a valid orchard crop in at least sixteen American nations from lower Mexico to Bolivia. This same Hevea tree has been and is being grown by the millions of acres in such Far East tropics as Malaya, Sumatra and neighboring areas, from which prior to Pearl Harbor, U. S. manufacturers imported as much as 97 percent of all our rubber supply. Pearl Harbor was the flash of lightning which revealed the dangerous folly of depending almost wholly on Far East sources for this greatest of all tropical exports.

The goal of wisely directed planting of Hevea rubber in the American tropics is not to filch the great established crop of one hemisphere and grow it in another, to the lasting injury of the first. The goal is not to throw one agricultural area into bitter economic rivalry with another, as for example to enable the American tropics to mow down the Eastern tropics or vice versa. Both the Eastern and the Western tropics are permanent parts of our world, and both are far too important to themselves and to us to be carelessly knocked down or built up.

Future for Tropical America

I believe that rubber is one of several vital tropical crops which should be produced in this hemisphere, not to the exclusion of their importation from other sources, but enough so that in time of emergency the Americas will not again be whacked off from sources of such vital materials. This very day, good high-yielding clones or strains of Hevea trees are growing in Central America, which, of course, is part of our own North American continent. It goes without saying that if we could buy even one-fourth of our proved needs for natural rubber from the nations of Central America, this would profoundly help both these near neighbors and the Central American markets for U. S. goods. If we could buy even 1 percent of our needed natural rubber from Haiti the export trade of this neighbor nation would be almost doubled. Comparable gains and advantages could be realized by our allies and friends in tropical South America. Let's remember that in our hemisphere

the good of the other Americas is also our good and vice versa.

We have been hearing a great deal about natural rubber as a harvest from the toil of the downtrodden coolie. Well, it is about time that certain sociological weepers realized that natural rubber is also a valid and well proved yeoman crop. It can be and probably in most cases should be grown by the independent, landowning tropical farmer and his family. Hevea rubber can be harvested and sold in the manner of any other valuable and relatively easy crop. At world prices of crude rubber current since 1936, natural rubber is profitable. As a matter of fact, Hevea rubber has long been grown by landowning, independent farmers in Sumatra, Malaya, Indo-China and many other great rubber strongholds, and we know that it can be grown by free men in our own nearby American hot lands.

Advances in Hevea Culture

Certain of our would-be wise men have a way of implying that synthetic is the new way and natural rubber is the old way. In Germany Buna S., which is the momentary white hope of our would-be synthetic program, has been in manufacture for more than twenty-five years. When Germans began routine manufacture of Buna S, average yields of cultivated Hevea rubber were under 300 pounds per acre yearly. Even during the querulous lifetime of Buna S. almost fabulous progress has been made in the agronomy of natural rubber. Selective breeding, budgrafting and advanced nursery practices and orchard management methods are combining to increase average yields of Hevea trees from the old level of under 300 pounds of sheet latex per acre yearly to present levels of 1,200 to 1,500 pounds, with record harvest as high as 1,970 pounds per acre. Now most of the new Hevea orchards and nurseries which are now being planted in Central and South America are from these high-yielding strains planted with knowledge born of proved agronomy and brilliant research.

The American tropics and certain other hot lands hold much of the richest soil known anywhere in the world. It is not easy for any factory or any advertising writer to produce tangible goods in direct competition with the age-old firm of rich land, plentiful rain and hot sun and a great crop which is growing and in harvest 365 days of every year. Just to talk cold turkey about a hot subject, a great new age of rubber is actually growing out of the soil of nearby American neighbor nations.

Current Literature At a Glance*

Jefferson. In observance of the tenth anniversary of the founding of the publishing house, the Chronica Botanica Co. has issued, as a preprint of Volume 8 of *Chronica Botanica,* a 64-page booklet on "Thomas Jefferson and the Scientific Trends of his Time" by Charles A. Browne. Early maps, reproductions from some of Jefferson's own works—such as plans, charts, records, letters, and designs—and other examples of things concerned with Jefferson's life illustrate the paper, which deals with Jefferson's position in the world of science, his published "Notes on the State of Virginia," his service to the nation through his interest in science, his role as an agriculturist, and his interest in science as an essential part of education. Toward the end of the paper an interesting letter is quoted, written at the age of 83 to Dr. John P. Emmett, Professor of Natural History at the University of Virginia, urging the immediate establishment of a school of botany and a small botanical garden.

The subject of Thomas Jefferson was chosen for this anniversary number as a tribute to the New World, where the publishing house, which began its work in Holland, has found a haven since the war.

Forestry. A plea for the conservation of forests by proper handling of them, for the sake of social benefits as well as industry is contained in an illustrated booklet, "Forestry and Paper" issued by the P. H. Glatfelter Co. Facts about trees, their growth and their structure introduce the text, and some forest statistics conclude it.

* All publications mentioned here—and many others may be found in the Library of the Botanical Garden, in the Museum Building.

Peru. One of a series of papers published by the Pan American Union in Washington, D. C., deals with the agricultural co-operative movement in Peru. Twenty other similar reports in English, seven of them on Latin-American countries, are available at 10 cents each.

Jackson Hole. The October issue of *The Living Wilderness* tells the story of the creation of Jackson Hole as the country's newest national monument. The history of the place from 1827, when the region was named after a partner in the Rocky Mountain Fur Co., to the present day is given in chronological order by T. S. Palmer and Robert Sterling Yard. Photographs and maps depict this unique area and its surroundings.

Notices and Reviews of Recent Books

(All publications mentioned here may be consulted in the Library of The New York Botanical Garden or may be purchased on order through the Library.)

The Almanac's Successor

THE FORESTRY DIRECTORY. Compiled by Tom Gill & Ellen C Dowling. 411 pages illustrated, indexed. American Tree Association, 1214 16th St., N.W., Washington, D. C. 1943. $2.00.

For those who have need of exact and accurate information regarding the forestry organizations of this country and of Canada, both public and private, this Directory is a remarkably complete and satisfying handbook. First published twenty years ago, under the auspices of the late Charles Lathrop Pack, three Forestry Almanacs served their purpose well. This volume is now doubly welcome because it is ten years since the American Tree Association brought out its last Almanac, and because this Directory—a better name—includes much new material. The book is well put together, and contains good maps and well chosen charts.

With the statements about the Federal and State organizations directly concerned with forestry, the schools of forestry, and the private conservation and forestry associations, there is now, for the first time, also material about other branches of the Federal Government that carry on conservation work, like the Department of the Interior, the Soil Conservation Service, and the Tennessee Valley Authority. The factual statements include all conservation agencies, popular as well as scientific. They likewise cover fifteen trade associations representing lumber and pulp interests. For the first time, too, appear statistics and other data regarding the forests of Canada.

Thanks to skillful editing, a feature of the Directory is an organic series of concise statements, prepared by foresters who are authorities on special aspects of the varied activities of the profession. Several brief historical summaries sketch the background of significant developments.

RALPH S. HOSMER,
Professor of Forestry, Emeritus, Cornell University.

Indian Customs

PIMA AND PAPAGO INDIAN AGRICULTURE. Edward F. Castetter & Willis H. Bell. 245 pages, illustrated; bibliography and index. University of New Mexico Press, Albuquerque. 1942. $3.50.

A historical record of the culture, agriculture and customs of the Pima and Papago Indians of the Southwest. Recorded data of our North American Indian tribes is most valuable since the aged informers and interpreters of Indian customs are fast passing on, with the result that much will be lost for future students interested in the subject. This book, which is an excellent reference work, is rich in authentic information on the customs of the two tribes. Its specific value lies in the record of the method of agriculture worked out by the tribes under adverse climatic conditions and also of the acceptance of Old World economic plants in their agriculture through Spanish channels of Mexico.

G. L. WITTROCK.

Notes, News, and Comment

Sunday Lectures. During March a series of four free Sunday lectures on Victory Vegetable Gardening, arranged in cooperation with a Victory Gardening committee of the Bronx, headed by P. J. McKenna, is being given in the Museum Building at 3 p.m. Subjects and speakers are as follows:

Mar. 5 *Planning a Practical Garden*
T. H. Everett

Mar. 12—*Getting Your Soil Ready*
James G. Esson

Mar. 19 *How to Sow and Plant*
Joseph W. Tinsey

Mar. 26 *What to do in Summer*
E. T. Lloyd

Groups. Rosalie Weikert talked on diatoms before 18 members of the Science and Outdoor Club of Roosevelt High School at the Garden Feb. 17. For demonstration during the talk Miss Weikert used diatom photomicrographs, samples of diatomaceous earth, diatom slides which the students examined under the microscope, and ornamental marine algae from California, on which diatoms were growing.

Fifteen botany students from Hunter College under Dr. Jennie L. S. Simpson visited the Garden Feb. 26 to study the museum collection of thallophytes. Earlier in the month a group from Hunter visited the Main Conservatories.

Lectures. Affiliated garden clubs which have been recently addressed by the Garden's staff members include the Greenwich Garden Club Feb. 15, on "Victory Gardens" by T. H. Everett; Flushing Garden Club Feb. 28, "Daylilies: Old and New" by Dr. A. B. Stout; and the garden section of the Bronxville Woman's Club Feb. 29, "How to Grow Healthy Plants in the Garden" by Dr. B. O. Dodge.

Other lectures given last month by members of the staff include "Botanizing in Fiji" by Otto Degener before the Federal Plant Quarantine Club of New York Feb. 16 and "Victory Gardening" by T. H. Everett at a rally in the County Center at White Plains Feb. 7.

Serving. Dr. William J. Robbins has been appointed to serve on the Science Advisory Committee of the Technical Advisory Service of the Smaller War Plants Corporation of Washington. He has also been named to serve on the Board of Trustees of the Biological Stain Commission, Inc., headquarters for which are in Louisville, Ky.

Conference. Refreshments served after the staff conference of February 10 marked the 25th anniversary of the association of Dr. H. A. Gleason with the New York Botanical Garden. The speaker of the day was E. J. Alexander, who illustrated his talk on "The Genus *Echeveria*" with a collection of living plants.

Pratt Medal. T. H. Everett was the recipient of the George D. Pratt Medal of Achievement, the tenth and last of these awards to be made by the Horticultural Society of New York, at a ceremony Jan. 19. The medal was established by the late George D. Pratt with the stipulation that it be awarded annually for ten years to a professional gardener who was considered "an outstanding member of his craft."

Henry B. Heylman. A member of the Corporation of the Botanical Garden during the past eleven years, Capt. Henry B. Heylman died at the age of 71 Feb. 17 at his home in Pelham Manor, N. Y. He had served in both the Mexican and the first World Wars, and previous to his retirement in 1934 had practiced law in New York for 39 years.

Exhibition. The Bronx Artists' Guild will have its 22nd annual exhibition in the Garden's Museum Building from April 16 to May 7.

Journal. Sets of back numbers of the Journal of the New York Botanical Garden are being offered at the special price of $28 for volumes 1 through 44. The sets are complete with the exception of a few numbers missing from volumes 40 and 41 (1939 and 1940) after the first few orders have been filled. Members of the Garden and subscribers to the Journal who have and are willing to part with their issues of February, March, July, and August 1939, and of March 1940, will be doing the Garden a great favor if they will mail them in at once.

Tropical Expedition

DR. BASSETT MAGUIRE left New York near the end of February to embark on a five months' botanical expedition in South America. He plans, after arriving in Surinam, to go to British Guiana where he will travel from Georgetown to Kaieteur Falls in an exploring party arranged by D. B. Fanshawe of the Forest Station at Mazaruni. He will collect on the savannahs above the falls, in the Kaieteur gorge, and in the transition zones.

Returning to Surinam, Dr. Maguire will then go inland again, this time to explore Table Mountain in the Wilhelmina range in company with Dr. Gerold Stahel, Director of the Agricultural Experiment Station in Paramaribo.

In addition to making general collections in these regions, all of which are of great botanical interest, Dr. Maguire plans to send and bring back seeds of economic plants, particularly nut-bearing trees, and of ornamental plants that can suitably be grown in other sections of tropical America and in northern greenhouses. Many of these seeds will be sent to government agencies that are equipped to experiment with them in the various tropical American countries.

The expedition, to be known as the NEW YORK BOTANICAL GARDEN TROPICAL EXPEDITION OF 1944, is being partly financed by a grant-in-aid from the American Philosophical Society and by other agencies, in addition to the sum provided by the Garden itself.

Question Column

What species were used in hybridization to produce "celtuce"?

The evidence indicates that the vegetable called "celtuce" in trade catalogs is not of hybrid origin but is a variety of a wild species, *Lactuca scariola*, that is a native in the Old World. The wild type of this species was incidentally introduced at an early date into eastern United States where it is now a weed over a considerable area. The wild plants have a rather scraggly growth and the leaves and stems are tough and fibrous. The common names for this plant are prickly lettuce, wild lettuce and compass-plant.

Courtesy of W. Atlee Burpee Co.

A cultivated plant of "celtuce"

According to verbal statements by Dr. Roberta Ma, a horticultural variety of this species which has a robust and lush growth has long been cultivated in China under the name WOO-CHU. The tender young leaves are used as greens and in salads and the fleshy succulent stem is peeled and sliced, then is eaten either raw or cooked.

In 1938 seeds of this Chinese vegetable were sent by Rev. Carter D. Holton from western China to the W. Atlee Burpee Company, and four years later (in 1942) seeds were offered for the first time in the seed catalog of this firm under the name "celtuce." No claim was made that this variety had a hybrid origin.

The garden varieties of the true lettuce have been developed from another species of the genus *Lactuca*.

A. B. STOUT.

THE NEW YORK BOTANICAL GARDEN

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To reach the Botanical Garden, take the Independent Subway to Bedford Park Blvd. station; use the Bedford Park Blvd. exit and walk east. Or take the Third Avenue Elevated to the Bronx Park or the 200th St. station, or the New York Central to the Botanical Garden station.

Membership in

THE NEW YORK BOTANICAL GARDEN

and what it means

TO THE INSTITUTION, membership means support of a program that reaches several hundreds of thousands of persons annually.

Briefly, this program comprises (1) horticultural display, (2) education, (3) scientific research, and (4) botanical exploration. To further this work and to disseminate useful information about plant life to the public, the Garden issues books and periodicals, both scientific and popular, and presents lectures, programs, radio broadcasts, and courses of study in gardening and botany. The laboratories and large herbarium and library serve the staff in its research and educational work, while the extensive plantings at the Garden give the public vistas of beauty to enjoy the year around. The public is also free to use the Botanical Garden's library, and, under direction, to consult the herbarium.

TO THE INDIVIDUAL, membership means, beyond the personal gratification of aiding such a program, these privileges:

Free enrollment in courses up to the amount of the annual membership fee paid.

A subscription to the Journal and to Addisonia.

Admission to Members' Day programs and use of the Members' Room also at other times.

A share of plants when made available for distribution. (These plants may include the Garden's new introductions into horticulture.)

Personal conferences with staff members, upon request, on problems related to botany and horticulture.

Free announcements of special displays, lectures, broadcasts, programs, and other events.

Use of lantern slides from the Garden's large collection, under established regulations for such loans.

A membership card which serves as identification at special functions at the Botanical Garden and also when visiting similar institutions in other cities.

* * * *

Garden clubs may become Affiliate Members of the New York Botanical Garden, and thus receive certain privileges for the club as a unit and others for individual members. Information on Garden Club Affiliation will be sent upon request.

* * * *

Classes of membership in the New York Botanical Garden are:

	Annual Fee		*Single Contribution*
Annual Member	$ 10	Member for Life	$ 250
Sustaining Member	25	Fellow for Life	1,000
Garden Club Affiliation	25	Patron	5,000
Fellowship Member	100	Benefactor	25,000

Contributions to the Garden may be deducted from taxable incomes.

Contributions to the Garden are deductible in computing Federal and New York estate taxes.

A legally approved form of bequest is as follows:

I hereby bequeath to The New York Botanical Garden, incorporated under the Laws of New York, Chapter 285 *of* 1891, *the sum of*_____.

Gifts may be made subject to a reservation of income from the gift property for the benefit of the donor or any designated beneficiary during his or her lifetime.

All requests for further information should be addressed to The New York Botanical Garden, Bronx Park, New York 58, *N. Y.*

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IN TWO SECTIONS
SECTION ONE
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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

THE LURE OF GARDENING

TO be a good gardener one must have a strong liking for gardening; as a sentimentalist would probably put it, one must dearly love it. Most gardeners are not apt to phrase it just that way, but surely gardening does have a lure for them and they come back for more of it year after year, unless by means of greenhouse and frames they keep at it all year and so through the years. The labor of it, to the middle-aged and the young, is but good exercise, equal in its beneficial results to the bodily good derived from indulgence in most forms of sport. Those grown old, if they can have the more strenuous tasks performed for them by younger hands, may still derive much in the way of good health by their activity in working at the lighter tasks.

As a mental exercise gardening brings into play alertness, reasoning, the ability to plan and look ahead; the use of good judgment and the development and use of system. It may be said that all this is too exacting but let it be remembered that if the faculties of the mind and the organs of the body are not duly exercised they soon wither and decay and the individual instead of being worth while soon becomes of no account and a burden to his family and a bore to the few that may remain his friends.

To those who are engaged in any vocation, mercantile or professional, gardening is a most desirable avocation as it involves a complete change in mental activity and, at the same time, gives unconsciously to the body the exercise which in many occupations is totally lacking. And for the brains and energy expended upon it, it returns in pleasure and utility in the beautiful blooms and the full-flavored vegetables, rewards from which the gardener may derive legitimate pleasure and in which he may take pardonable pride.

John H. Myers.

Mr. Myers, who is a member of the New York Botanical Garden, will take part in the Garden's broadcast over WNYC May 19 at 3:30 p m., telling some of his experiences in growing flowers and vegetables in his own small greenhouse.

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"March, April and May are the time of spring;
In spring golden Venus rejoices in the sowing of flowers."

An Etching by Pieter Brueghel, Flemish, Sixteenth Century
(Courtesy of the Metropolitan Museum of Art)

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The Great Mother Forest

A Record of Richard Spruce's Days Along the Amazon

By Victor W. von Hagen

TO Richard Spruce the Amazon appeared as a monstrous tree. Its tributaries, its streams, its brooks were its boughs; the twigs, the branches of its ascending and spreading ramifications. His mind saw that dark region where the river-branches lost themselves as an impenetrable density of green. One enters these green mansions and one vanishes, and vanish Spruce did on the edge of a primeval forest, just below Santarem.

"There were enormous trees," he wrote, "crowned with magnificent foliage, decked with fantastic parasites, hung over with lianas which varied in thickness from slender threads to huge, python-like masses, rounded, flattened, twisted with the regularity of a cable."

Thus wrote Spruce, seated on a fallen jungle giant. He gazed long at the interwoven intricacies of this tropical forest. There was a constant shifting of light and shade, a chiaroscuro of deep blacks and dancing lights. Trees were supported by trunks and by subtending buttresses which were like the flying buttresses of Gothic cathedrals, rising in flat curves, meeting in sharp points, like the ribs of a Gothic vault. Below it was cool, cellar cool. Never did the temperature reach much beyond that of a summer evening in Yorkshire. Then what made the trees so huge, the growth so thick? Heat? No! The warm and luscious body of the earth? Yes, but something more—climate. The underlying factor in the evolution of these types of trees, was climate, not alone higher temperatures, but uniform temperatures, that was the answer to the luxuriance of the jungle. In Yorkshire they had milkworts [euphorbias], stunted plants which, when broken, yielded a white sap; but here the chief euphorbiaceous plant was the rubber tree, a hundred feet high. The same with the Leguminosae. In England

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This article, like the one which appeared in the January Journal, has been adapted from the manuscript of one of the chapters in Dr. von Hagen's forthcoming book, "South America Called Them," to be published during the summer by Alfred A. Knopf, Inc. It is used here by kind permission of the author and publisher.

they were peas, beans, vetches; here in the Amazonian jungle they were magnificent trees, two hundred feet tall. Nearly all the vegetation in the Amazon was arborescent.

"Fancy if you can," ran his letter home, "two million square miles of forest . . . The largest river in the world flows through the largest forest . Here our grasses are bamboos, sixty or more feet high . Our milkworts are stout woody twiners, ascending to the highest tops of trees . . . Instead of your periwinkles, we have here handsome trees exuding . a most deadly poison. Violets are the size of apple trees . . . Daisies borne on trees like alders."

Richard Spruce rubbed his hands over all this botanical loot. Yet how was he to obtain this treasure? To identify the plant he must have leaves, fruit, and blossoms. And these were, so far as he was concerned, heaven-high and out of reach.

"Both flowers and fruits were for a long time sour grapes to me. Like Humboldt, I was at first disappointed in not finding some agile and willing Indians to run like cats or monkeys up the tree for me At length the conviction was forced upon me that the best, and sometimes the only way to obtain the flowers and fruits was to cut down the tree: but it was long before I could overcome a feeling of compunction at having to destroy a magnificent tree, perhaps centuries old, merely for the sake of gathering flowers."

Spruce readily comprehended that the "natives themselves think no more of destroying the noblest trees, when they stand in their way, than we the vilest weeds . . . a single tree cut down is no more missed than when one pulls up a stalk of groundsel . . in any English corn field . " And the Indians were filled with astonishment when Spruce told them that in his country most of the forest had to be planted.

"Trees planted? Why, here," said they, "when one wants to plant a tree, one must first cut down a dozen to make room for it."

". . . Thus I reconciled myself to the commission of an act whose apparent vandalism was, or seemed to be, counterbalanced by its necessity and utility. In the same way I suppose a zoologist stifles his qualms of conscience at killing a noble bird or quadruped merely for the sake of its skin and bones. I do not know whether Alexanders and Napoleons made use of any such process of reasoning to justify to themselves the waste of human life entailed in their victories; but if the bodies of the slain at Arbela or Austerlitz could have been collected and preserved—stuffed and set up in attitudes of mortal agony—under cases in one vast museum, what instructive specimens they would have been of the fruits of war."

At first Spruce was reduced to gathering vegetation that was easily accessible. The marshy places about the muddy mouths of the IGARAPÉS (an Indian term for small rivers) yielded a vast store of handsome but

rank grasses, then the smaller plants with their leaves and blossoms were collected. Growing bolder, Spruce began to have his Indians fell the giant trees. It was a slow and laborious process. Hours might be spent in felling a single tree. The crashing giant then brought down others in the fall, along with a tousled head of epiphytes and parasites. Orchids were plentiful; so were the giant cyclanths, with their enormously broad bifid and fan-shaped leaves. Lianas, which were strung from tree to tree (SIPOS, they are called in Tupi language) came down with the fallen masses, dragging the parasites down like bell-ropes. Spruce gathered the many species that festooned a single tree. There were the sarsaparillas, a liana much in the commerce of his time; there were the YURUPARIPINA, the devil's fish-hooks, with broad, sharp thorns that could catch up a man with their formidable hooks. Termites' nests, brown, earth-colored nests, would tumble down with the trees. Ants rained on his head. The falling tree had begun a virtual pandemonium in the jungle. The monkeys would first scream and run, then return to scold him. Green and red parrots screeched; the proboscid toucans would descend to inquire with their gaudy-colored harlequin beaks the necessity for all this disturbance of their jungle-peace.

At first the jungle seemed rigid, dead and inert, then Spruce became aware that the whole thing lived, breathed and pulsated. Insects were formed to look like leaves; leaves were disguised to look like insects; delicate leaf-forms were sandwiched between bull-horn-shaped thorns, innocent-looking leaves had on their underside long prickly hairs that were as irritating on touch as the bite of a wasp. Butterflies with transparent wings fluttered through the interstices of the jungle wall. Below, the world belonged to the insects. In the gloom and black ooze of the jungle floor, long lines of red Sauba ants hurried along in endless processions, each clenching tightly in its mandibles a bit of green leaf the size of a twopence. Other ants, the yellowish, black, blind, insensate army ants, were on the march moving like a running brook, a yellow flood of insects in marauding columns, sending all the rest of insectdom to flight. Over the stagnant pools, formed by the ceaseless drip, drip of rains, dragon flies hovered, dazzling porcelain-blue. And there was a symphony of voices, too, in the jungles. Many the time when Spruce was busy with pressing his beloved plants, voices would break out about him. His musical ear caught sounds that seemed to pour from a flute. This was a small spotted bird, called UIRÁ-PURÚ, which a Brazilian told him "played tunes for all the world like a musical snuffbox." It was at high noon, when the sun was in the meridian, and when it is momentarily quiet that Spruce heard the uirá-purú . . . "There was no mistaking its clear bell-like tones as accurately modulated as those of a musical instrument. Its 'phrases' were short, but each included all the notes of the diapason, and after repeating one phrase perhaps twenty times, it would suddenly pass to another, sometimes with a change of key to a major fifth." Young Spruce sat there poised, his ruddy

face cocked, his blue eyes glistening, as he listened to the uirá-purú. On paper he should have used to press plants, he copied down its notes, putting them on a musical scale. The tone was of unearthly limpidity and it left the jungle pregnant with sweet melancholy. "Simple as this music was, its coming from an unseen musician in the depths of that wildwood gave it a weird-like character . . . it held me spellbound for near an hour . . ."

The jungle was really never still. The cicadas hammered away on their drumheads, pounding on the tympana, until the jungle pulsed with sound. Frogs joined in with a rapidly beating "peng, peng, peng," sounding to Spruce as if he were in the midst of a boiler factory. The day seemed to tremble in the rhythmic clangor. Spruce hated to leave this magical forest, but the Captain was impatient. He reluctantly climbed aboard again, and they ploughed up the Amazon.

* * * * *

Parrots squawking in the quiet air announced the dawn. An alligator floated by, a flock of giant JABIRU storks flew by, low enough for an Indian on the *Tres de Junho* to level his bow at them. A strip of white beach came into view, then some sharp hills filigreed with palms, and then immediately below it a line of houses: this was Santarem, 475 miles up the Amazon from Pará. Here the río Tapajoz, an enormous black, noble river, entered the Amazon from the south and its ink-black waters sharply contrasted with the yellowish Amazon. Fully thirty miles wide at this spot, the Amazon was an immensity of water, a mobile plain of burnished silver. Spruce could now see why the natives called it the Ocean-River, for it is generally supposed now that the Amazon, at a time too distant for computation, was, in fact, an ocean, a shallow sea separating the Andes, the highlands of Central Brazil, and the mountains of Guiana. The action of rain, the flowing rivers from these highlands, gradually built up the shallow sea with silt, and this gave rise to the gigantic, low-lying jungle whose secrets Richard Spruce was to lay bare in this seventeen years' sojourn.

The *Tres de Junho* maneuvered so as to miss an acre-wide floating grass island, tacked about, filled its sails with the heavy persistent breeze of the VENTO GERAL, and so, within seventeen days to the hour, Spruce arrived at Santarem.

Captain Hislop waited for him under a statuesque silk-cotton tree which spread itself at the bank of the ocean-river. Hislop, ruddy and sturdy, monstrously tall alongside the Indians, shared the shade of the tree with a covey of storks, some cattle, and a row of chocolate-colored babies (that rested astride the hips of their Indian mothers, naked save for a string of beads).

Hislop was the patriarch of Santarem. A booming voice, a Scotch burr that forty-five years in the Amazon had not erased, he had, despite the fact

TWO PORTRAITS
OF RICHARD SPRUCE

The one at the left, from an autographed photograph presented to the New York Botanical Garden by Mrs. N. L. Britton; the one at the right, made at the age of 72, from the frontispiece of Spruce's "Notes of a Botanist on the Amazon and Andes," edited by Alfred Russell Wallace and published in 1908.

that he spoke Portuguese with an accent too variant to be fully understood, built up an extensive trade in diamonds, gold-dust, rubber, and tonga-beans that had reached up to Cuyaba, the capital of the mountainous province of the Matto Grosso. Hislop, in his declining days, had given up that vast trade, "having suffered serious losses," as he explained, "from the roguery of his agent and the failure of his creditors." Now his trade was canalized with Pará.

Hislop found Spruce a house—a wattle and daub affair, with palm-plaited roof, a single room, a floor of tile ("instead of mother earth, as in

the houses of inferior class") and devoid of a single article of furniture. He dug up a few chairs, sent over some planks which, with a pile of bricks, Spruce and his assistant, Robert King, extemporized for a table on which to put their plants; some slaves were sent to do their cooking, and other English residents—a Mr. Jeffries and a Mr. Golding—lent further articles. Within a few hours Spruce was all but ready for his assault on the jungles of Santarem.

The night of their arrival, Hislop had the whole English colony over for dinner. Alfred Wallace had returned from collecting, bringing his friend and co-explorer, the quiet, unobtrusive Henry Bates. Jeffries and Golding arrived. And mine host opened brandy bottles he kept for such occasions.

Captain Hislop was a true Chesterfieldian who held that his dinner party "should not fall below the number of the graces nor exceed that of the muses." From the opening of the first bottle, through the courses of farinha, fish, and roasted manatee flesh, Hislop held the floor . . . If the port wine lasted long enough, he would eventually get to the subject of Moses . . . Henry Bates, who had heard this before, busied himself in collecting insects that poured in, attracted by the kerosene light: winged ants, flying termites, night cicadas, mayflies, mosquitoes fell in myriads about the light, and all the taciturn bespectacled Bates would have to do was to sweep them into his collection box.

Bates was twenty-three years old when he came to the Amazon with Wallace. He had been there two years now and was destined to remain nine more. He had found the Amazon an Elysium for the entomologist. He collected 14,000 different species of insects, of which 8,000 were new to science. Like Wallace and Spruce, he was one of those superb, self-taught naturalists. By patient collecting and observation, he "became the discoverer of protective mimicry." And long before Darwin had published his "Origin," Bates had written: "Nature writes on a tablet the story of modification of the species."

Self-effacing, modest to a fault, Bates was primarily an entomologist. Still, his interests were broad enough to include descriptions of birds, reptiles, marmosets, turtles, termites. "His eyes," as Cutright puts it, "were clear, his brain was active and his pen was graphic," but he did not make extensive journeys, and he kept to certain defined areas. Urged on by Charles Darwin on his return to England, he wrote his "The Naturalist on the River Amazon" which described the region more fully, more accurately, more completely than any book before it. It became, for a while, the guide book for those who would exploit the riches of the Amazon. . .

The fumes of the port wine had broken down the natural reticence that envelops the souls of Englishmen. Alfred Wallace and Richard Spruce found an immediate interest one in the other. Like that of Humboldt and

Bonpland, their friendship was to last over half a century, and Alfred Wallace, after having reached great fame as the co-discoverer of the "theory of natural selection" with Charles Darwin, would, in the ebb-tide of his life, take over the editorship of Spruce's journals.

Wallace was younger than Spruce by some seven years. He had been born at Usk, Monmouthshire, in 1823, and like his illustrious South American predecessor, Humboldt, he lived ninety years. His early life paralleled that of Richard Spruce. He was interested in botany, he was a self-taught naturalist and he taught school. He had met Henry Bates and their common interest, stimulated by reading Darwin and Humboldt, led to the formation of plans to visit South America. Wallace was twenty-five years old when he landed in Brazil. His love of the unknown, his insistence on covering great chunks of ground, brought him far up the río Negro where the privations of an explorer's existence brought about a general deterioration of his health. He remained only four years in the Amazon. Ill with malaria and intestinal difficulties, he took ship to England only to have that trip end in misfortune and tragedy. Seven hundred miles from Bermuda, his ship took fire; he was saved only by mere chance; his entire collections, formed in those four years of tireless effort, perished in the flames that enveloped the steamer *Helen*.

Although Wallace published, in 1853, "A Narrative of Travels on the Amazon and río Negro," the best book until his companion, Bates, published his own, Wallace belongs not to South America, but to the East—Malaya, the Celebes and Timor.

* * * * *

Spruce spent a whole year in the vicinity of Santarem. It was a good collecting station. A center of river traffic (despite the fact that it was dismal and forsaken), Spruce could there get paper which he needed for pressing his plants. Then, too, when he had sufficient plants together he could send them down to the Campbells' in Pará who acted as his shipping agents. The year in Santarem gave him the feel of the land. His Portuguese improved, he broadened his vocabulary of TUPI-GUARANI, an important Indian tongue on the whole Amazon, and the locality of Santarem gave him an unusual opportunity to reap a cross-section of Amazonic plants. Instead of the jungle-clad plains and artificial pastures which had to be carved out of the jungle at Pará, Spruce found at Santarem natural undulating savannahs, sloping gently upwards from the blue-black waters of the río Tapajoz. Every morning, after a cup of coffee prepared by a negro slave who tried to make it as black as her own skin, he and the young Robert King, with a native enticed from his hammock, loaded themselves down with plant presses and took to the collecting. By following Igarapé d'Irurá, a brook of clear water which took its rise in the

600-foot high hills back of Santarem, they reached their collecting grounds. Almost all the plants were new to science, and those that were not had to be collected again so as to give a rounded picture of the vegetation of the Amazon. Richard Spruce began by selecting what in his mind represented a typical ecological zone of the region. He collected all flowering or fruiting plants within that zone. Then, when this had been in a sense exhausted, he would select on a wider range the important trees and plants that met his eye. In November the cashew tree was in bloom and was exceedingly abundant. Its leaves were of a delicate red-brown, and it was garnished with numerous pear-like yellow and red fruits, tipped with a kidney-shaped nut. There were palms of all descriptions, tall, squat, top-heavy. There was a seemingly endless parade of large trees; wild cacaos; ironwood trees, with smooth, pink trunks, but with a wood so hard that it dulled the axe in cutting; Brazil-nut trees with their three-cornered, hard-shelled nuts contained in a large pot-like shell . . . all these trees gave their leaves, their blossoms, their fruits, and their case-histories to the indefatigable labors of Richard Spruce. Nor were the smaller things neglected. Ferns grew in bewildering succession, some so minute that they could hardly be discerned, others so tall that they were called tree-ferns. He found an endless parade of parasites and epithytes adhering to the trees that his Indians felled, and wherever the soil was turfy from the incessant rains, he found mosses and lichens in the cushion-like patches beneath the towering jungle monarchs.

Richard Spruce was a careful botanist. Each tree had a name given to it by the Indians who had centuries-old acquaintance with it. These names he carefully recorded so as to correlate them with the scientific names. If the Indian indicated that the tree was used for medicinal purposes, Spruce gathered the bark, the rind, the leaves or the fruits, made the concoction under the direction of the Indian and tried it upon himself. If he deemed it important, he sent all the material (correlated with the plant collections) back to the pharmacists of Kew Gardens for examination. By ferreting out these plants, identifying them both with scientific names and native names, by testing their efficacy, he provided the agents of business with a guide book to the riches of the Amazon.

The explorer-scientists had replaced the soul-searching padres on the new continent. Men like la Condamine remained in the breath-searing Andes through icy wind and hail, and for what? To see if the world was flattened at the poles. Humboldt spent his fortune, ran a blockade, plunged up the seething, boiling río Orinoco, for what? To correctly ascertain where the Amazon and the Orinoco had their fluvial connection. Charles Darwin rode through strife-torn pampas to collect fossils. And Richard Spruce was to endanger his health, run a virtual demon's-gauntlet to open the green world of the Amazon.

Life Story Of The Mosses

By Frances E. Wynne

DID you ever really look at the moss that makes soft green carpets in the woods? Thousands of small stems with tiny leaves are in each mossy patch. In some the stems are erect, standing side by side and forming tufts; in others the stems creep and often are beautifully branched in a fern-like pattern.

Leaves of mosses are as distinctive as those of different kinds of trees or flowers. In fact, it is possible to identify mosses by their leafy stems alone, a feat not ordinarily accomplished with the flowering plants. Some moss leaves are toothed on the edges like a beech leaf; others are smooth like a dogwood. They differ in shape too, with infinite gradations from needle-like through lance-shape to circular. Whereas some are simple plates of cells without differentiation, others have either one or two veins up the center. In certain kinds this midrib is an elaborate structure ornamented with several vertical plate-like outgrowths. The midrib in some continues beyond the end of the leaf as a white or colored spine or hair. Tiny warts which are borne on the surface of the individual leaf-cells of many mosses give a peculiar and characteristic blue- or yellow-green sheen to the entire plant. In order to see these and the many other minute structures, it is necessary to look at moss leaves under high magnification.

Moss plants are not so intricate in their structural design as are the flowering plants, but they perform, somewhat less efficiently, the same life-functions. The leaves manufacture the food for the plant; the stems transport liquids (dissolved food and water), and special organs at the base of each plant anchor it to the soil. Moss stems do not have the special tubes for carrying liquids that are found in flowering plants. Much of the water used in the life processes rises on the outside in the spaces between the stem and its close-set leaves. The organs which attach mosses to their substratum are not roots as in flowering plants and ferns, but are simple thread-like structures called RHIZOIDS.

Mosses can grow in almost any kind of place, although any one kind of moss will grow only under certain conditions. Some mosses always grow on the trunks of living trees, others around the bases of trees, and still others on rocks. Our common woodland mosses prefer soil, humus, or decaying wood. Some that grow on dead wood are so specialized that certain of them grow only on logs which are covered with bark, whereas entirely different ones will grow on the same log after the bark has rotted away. Certain mosses always grow under water, but others grow best on the arid desert. Sphagnum moss often grows in floating mats over

water, forming the treacherous "quaking bogs" of northern lands. Under these conditions the moss does not completely decay when it dies, and pressure through thousands of years produces a compact mass of partly decomposed moss which becomes peat. Among aquatic mosses, those that cling to rocks in tumbling streams never invade still bogs and swamps. All mosses which grow in dry places or on rocks or high on tree trunks can do so because their leaves curl when dry, and thus conserve the water in them. They then look lifeless and dull, but a little dew or rain will expand the tiny leaves and revive the plants to activity. A person acquainted with the different kinds of moss and their habitat preferences knows which he can expect to find in swamp, meadow, ravine, desert, or forest. There are about 15,000 different kinds of moss in the world, more than 6,000 of which grow in North America.

"Moss green" is the name of a color used by painters and dyers. It cannot be used to describe the color of moss itself because almost as many different colors decorate the moss world as are found on the painter's palette. The most common woodland mosses are various shades of yellow-green or blue-green. Some are so pale that the leaves are almost white. Others are deep golden or even dark brown. Some peat mosses growing in sphagnum bogs are brilliant crimson while other bog mosses are such a deep red that they appear purple. Many mosses growing on rocks or trees are black; just as many have a long colorless hair-tip on each leaf, making the patch of moss look white or hoary.

As mosses present infinite variety in their structure, color, and habitat, so do they have a variety of ways to spread over the world. Almost any part of a moss plant, if detached from the parent, can grow into a new plant. Some mosses produce special leaves, buds, or branches which break off easily and form new plants when they are carried by wind, water or animals to a moist protected place. The kind of branch or bud produced is as characteristic of the kind of moss as are the leaves. The branch can be stiff and erect with many closely overlapping leaves, or without any leaves except at the tip where they are clustered in a ball or cup. Buds which function for vegetative propagation are borne on the surface, midrib, or extreme tip of the leaves where they are easily broken off. The leaf tips of certain kinds of moss are so fragile that a little friction breaks them, these can start a new moss colony. Also by simply growing and producing new stems and branches, mosses spread so that where last year there was only a small patch, this year several square feet may be covered with moss.

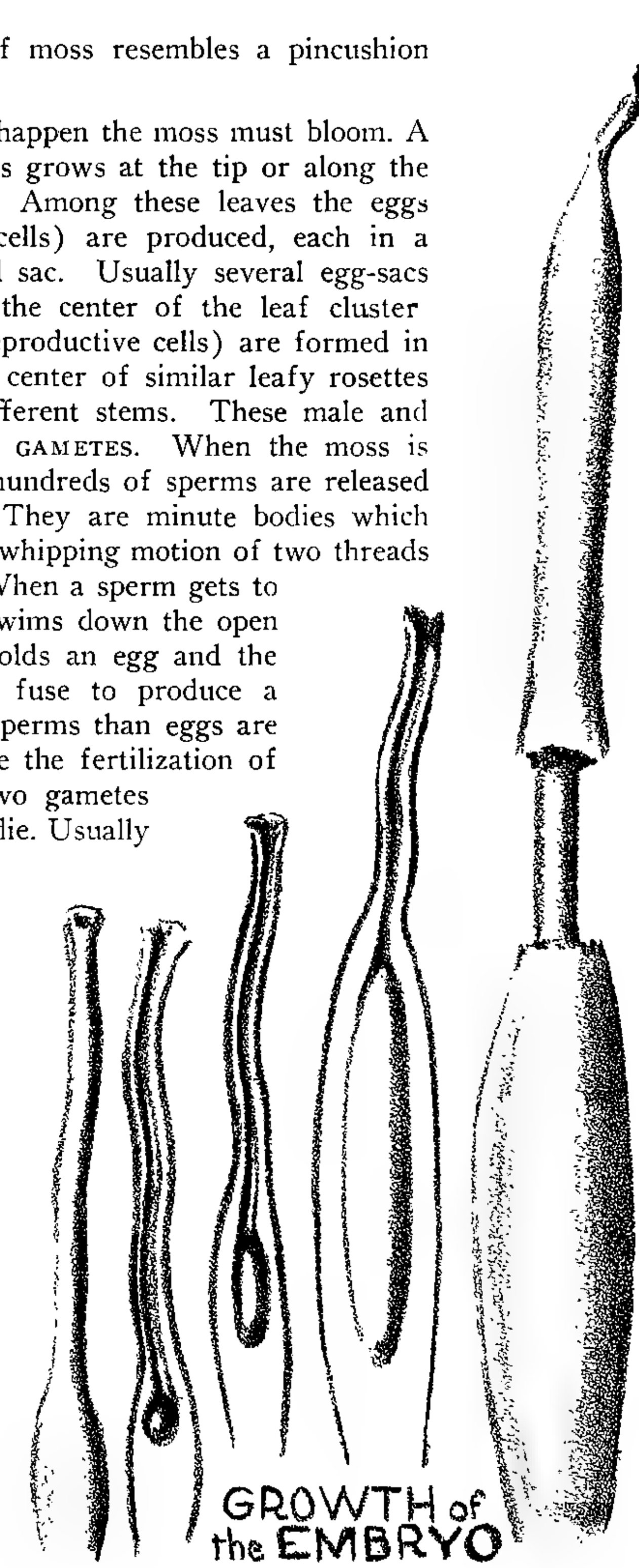
In addition to purely vegetative multiplication, mosses reproduce by a complex process analogous to the production of flowers and seeds by our flowering plants. At certain seasons of the year a different kind of stem grows out from the green leafy stem, and on the top of this a round or oval capsule. When these capsule-bearing stems are first apparent to the

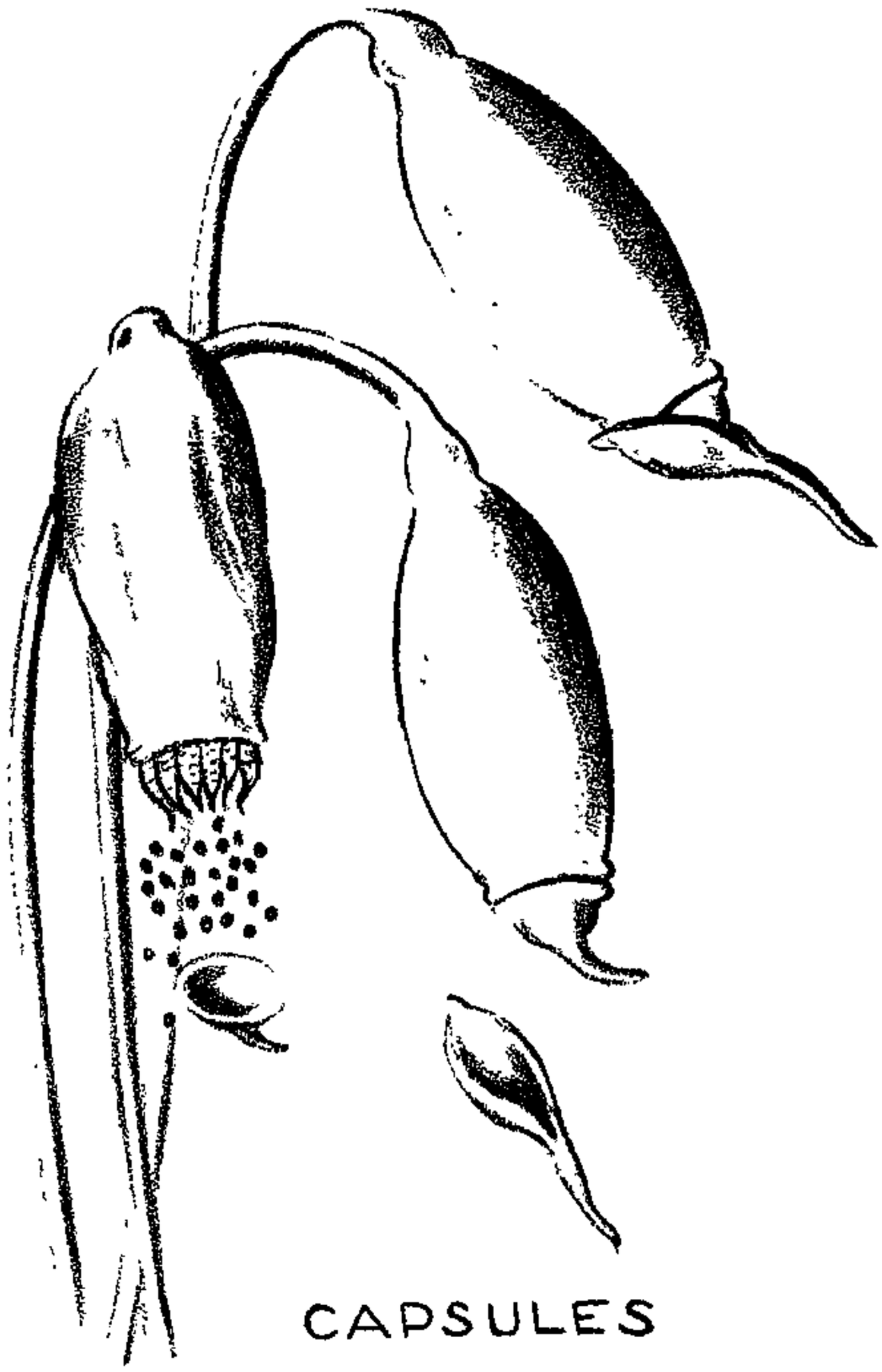
Drawings for this article were made by H. W. Rickett

passer-by, the patch of moss resembles a pincushion holding many needles.

But before this can happen the moss must bloom. A special cluster of leaves grows at the tip or along the side of a leafy stem. Among these leaves the eggs (female reproductive cells) are produced, each in a miniature bottle-shaped sac. Usually several egg-sacs grow side by side in the center of the leaf cluster Many sperms (male reproductive cells) are formed in urn-shaped sacs in the center of similar leafy rosettes on the same or on different stems. These male and female cells are called GAMETES. When the moss is wet with dew or rain hundreds of sperms are released from each male sac. They are minute bodies which swim by means of the whipping motion of two threads attached at one end. When a sperm gets to the female rosette, it swims down the open neck of a sac which holds an egg and the two reproductive cells fuse to produce a ZYGOTE. Many more sperms than eggs are produced to help insure the fertilization of the eggs, for if the two gametes do not fuse, they both die. Usually several of the eggs in each rosette are fertilized. They all begin to grow but seldom does more than one of them reach maturity. The fertilized egg which grows the fastest crowds out the others and produces the capsule on its shiny stem or SETA.

Mosses bloom unseen by humans except those who have powerful microscopes. The gametes are minute, as are the sacs which hold them. Only the experienced

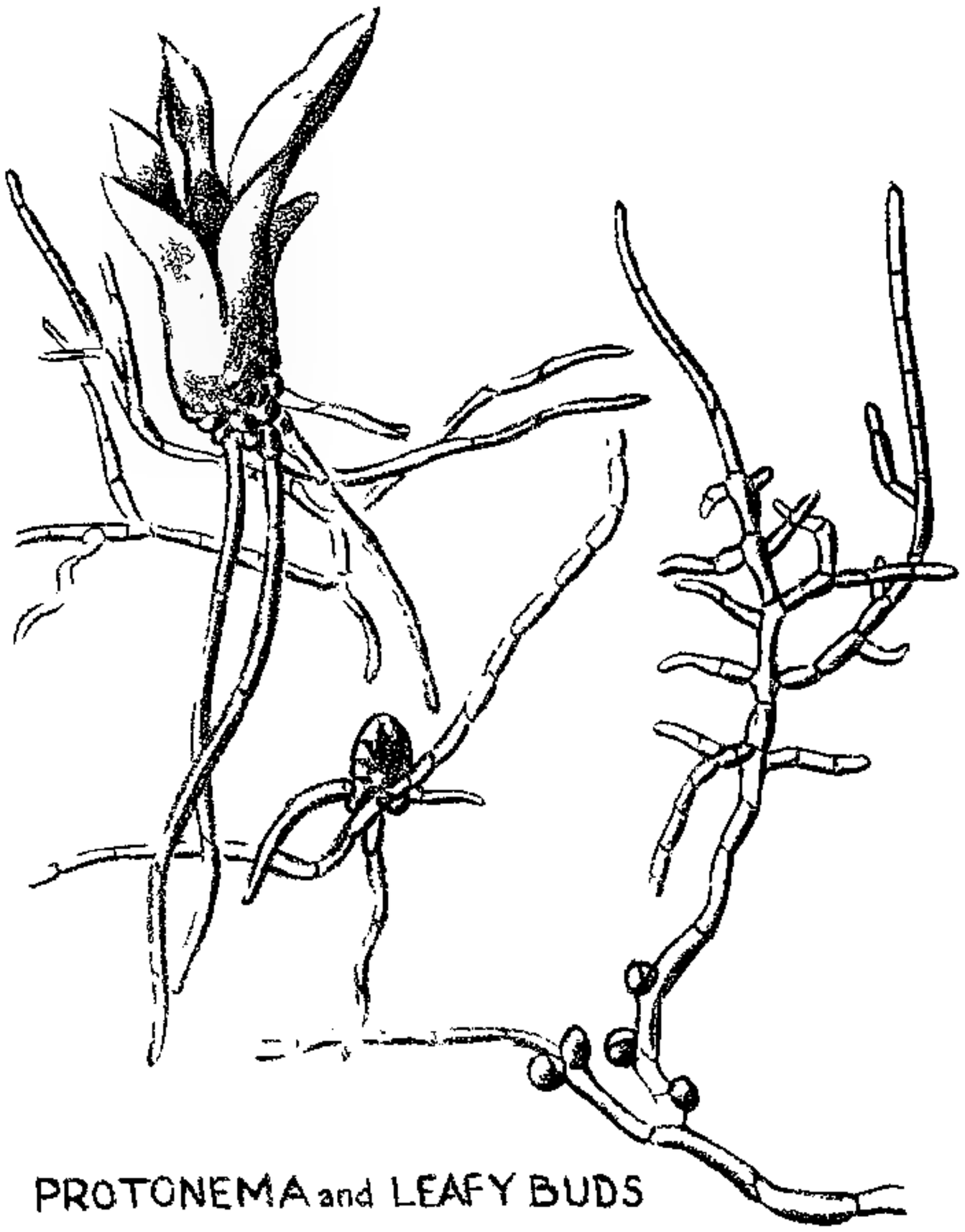




CAPSULES

eye can distinguish the leaves which surround these reproductive cells. The first obvious sign of a new phase in the moss life history is the needles in the moss patch, and by the time they are apparent this part of the moss's life drama is past. However, the moss capsule doesn't leave all its past behind. The bottle shaped sac which surrounded the egg grows with the developing embryo, keeping pace with it for a while. When the needle first appears, this sac is still surrounding it. The needle grows longer and longer until finally the sac is broken. But still it persists and sits on top of the needle protecting the thin but growing capsule. Not until the capsule is fully grown does it fall off. It is called then the CALYPTRA, a Greek word meaning a covering and referring particularly to a woman's veil.

When the calyptra does fall, it reveals the intricate architecture of the capsule. Under the calyptra is a conical cap—the OPERCULUM. When the operculum falls it reveals a still more fascinating design. Around the mouth of the capsule is a single or double row of teeth—called collectively the PERISTOME—especially constructed to respond to changes in the air around them. Imagine that the rays of a daisy had the ability to curl in over the yellow center and then uncurl in response to variation in humidity. Only when the air is dry do the teeth bend back, opening the capsule. Then the spores are shaken or blown out. Hundreds of tiny spores are inside



PROTONEMA and LEAFY BUDS

each moss capsule. These are the moss "seeds." Because they have a thick hard coat, they can survive extremes of temperature and humidity and remain dormant long without endangering their contents of living stuff. Some spores from the capsule may travel many miles. Others from the same capsule may never get any further than the edge of the moss patch that produced them. Only a few spores from each capsule find a suitable place to grow. If a spore is lodged in a damp, shady, cool place it will absorb water, swell, and break through its hard brown outer coating. But a moss plant does not appear immediately. The living stuff inside the spore grows first into a long green thread, the PROTONEMA, which elongates and branches. It may continue to grow and branch until it has covered several square inches of earth and caused the damp ground to look greenish. At intervals along this green branched thread, tiny buds will appear. Here finally is our new leafy moss, for each bud grows into a new plant; the protonema around it persists, turns brown, and becomes its rhizoids. Thus it is possible for one spore to give rise to many moss plants. An entire moss carpet may have come from a single spore.

It may not be apparent without the following recapitulation that

two types, or generations, of plants are involved in the life cycle of a moss. The green leafy moss plant that gave rise to the gametes (egg and sperm) is the gamete-producing plant or GAMETOPHYTE. The capsule on its stalk, or sera, produced from the union of two gametes, is the spore-producing phase or SPOROPHYTE. During its entire lifetime the sporophyte is attached to the gametophyte and dependent upon it for water and some food. The spores from the capsule grow into new leafy moss plants, the gametophytes, and thus complete the cycle.

Most of the other green plants we see in our forests and fields—the flowers, trees, grasses, and ferns — are sporophytes. The moss, among green land plants, is unique in having its conspicuous phase the gametophyte. Partly for this reason, mosses, although they lived on the earth long before there were any flowering plants, have not achieved great diversity or dominance. In spite of their diminutive structures and lowly stature—or perhaps because of them—the delicacy and intricacy of mosses reward the inquisitive and careful observer.

Raising Azalea Schlippenbachii From Seed

By Edward O. Birch

GARDENERS in the East have generally found *Azalea* (*Rhododendron*) *Schlippenbachii* a difficult subject to propagate from seed. One man, however, has had marked success with this eastern Asiatic shrub. He is an amateur, Edward O. Birch, of Short Hills, N. J., and he obtained his seed from a business friend in Korea.

When Mr. Birch sent in some snapshots of his home-grown azaleas in full bloom, the New York Botanical Garden asked him to write down his complete procedure, so that others might also be able to grow this handsome flowering shrub successfully.

"I hope this article will be of assistance to the amateur with nothing to work in but his open garden," writes Mr. Birch. *"After all, he is in the majority, and with a little success of his own, will become an enthusiast, especially when he finds he can raise these grand shrubs just as easily as perennials.*

"I don't think that many people know how simple it is to grow hardy shrubs for themselves. They put in time raising their own flowers, but amateurs never think of growing shrubs the same way. They want an immediate show, and do not have the patience to wait for the more slow-maturing plants. Perhaps this is understandable when they can buy ordinary shrubs so reasonably from the nurseries. However, there is no reason why the amateur, working and getting his experience in his garden of 'popular' shrubs, cannot bring along his own azaleas, or other good shrubs which he cannot afford to buy in quantity; and when these are of proper size, use them to replace his run-of-the-mill shrubs. At least, that was my experience."

Mr. Birch's notes are given here.

THE following was my procedure when growing *Azalea Schlippenbachii* in open ground from seed to maturity, from May 1928 to date.

First I made a small soil screen of one-quarter inch mesh on a frame 9 x 18 inches x 1½ inches high. This served various purposes as will be mentioned later.

Then I went to the woods for seed-bed soil. From under oaks I scraped away the loose surface of partly-decomposed leaves, twigs, etc., and found the natural dark gritty woods soil containing many small rootlets. I screened enough of this soil to make a bed of the cubic dimensions of the screen. (This, I think, is the best seed-bed soil for these azaleas, but if not

available, equal parts of sand, loam, and *fine* peatmoss can be used.)

In a lightly shaded spot I made an imprint of the screen frame and took the imprinted soil out to a depth of 2¼ inches, replacing it with the woods soil, bringing it up to a level just above the garden soil so it would not be a basin when it rained. This I watered thoroughly with a fine spray; scattered seed on the surface (not too sparingly); covered lightly with about one-sixteenth of an inch of the same woods soil, fine and dry. For protection I placed the inverted screen over the bed. This was removed when plants showed through. Then, to protect the seed bed from heavy rains, out of light wood I made a roof slightly larger than the bed area; nailed this to four small posts, two front 19 inches, two rear 17 inches, then put the shed over the bed and pushed the posts into the soil about 5 inches.

The seed bed was never allowed to dry out, but was kept damp (not soggy) by fine spraying. (There is no set rule for watering; all depends upon location of bed, temperature, winds, and good judgment.) Seedlings showed through after about three weeks and leisurely thereafter. They grew slowly, but were tough and wiry. When too close, say one-quarter inch, I transplanted them with a pocket-knife blade to any available place in the bed, and when this small bed became crowded, I extended its area with more of the same woods soil. The shed was removed when plants were about one-half inch high, and the bed was then covered with about one-eighth to three-sixteenths inch *finely* ground peatmoss. (This is imported and is difficult to obtain now. If unable to get fine peat for this seedling bed, use sphagnum moss rubbed to dust by hand, *not* fibrous peat, which should be reserved for larger plants.) At all times the soil around the seedlings was kept just about as damp as the seed bed had been. Plants were transplanted only as they become crowded and then spaced about one inch apart. (Don't be afraid to transplant any time up to the middle of August.)

In the middle of October I made sure that all seedlings were firm in the ground, and then covered the soil with fine peatmoss up to one-third the height of the still small plants, and for protection again covered the bed with the inverted screen. My seedlings were still under 2½ inches. (At the time I had little hope of their growing to such a size as they are today.)

In December I placed chicken wire one foot high about eight inches beyond the four sides of the bed, still leaving the screen in place, and filled the chicken wire with whole, clean oak leaves, which were not removed until the time in spring when perennial coverings were being taken up. I then firmed the small plants into the soil wherever the roots had become slightly heaved and were exposed. Not one was lost.

Beginning the Second Year

Plants were now about one year old, and after they had made spring growth, were again transplanted, as necessary, until the middle of August, to a nursery plot which had been prepared in early spring. It was a spot in open ground, *full sun*, about 12 x 10 feet, which had been a piece of good sod land used the previous year for vegetables. Over this I had spread about three inches of peat and incorporated it thoroughly with soil to the depth of the fork, bringing up *no subsoil*, which in my location is more or less gravelly. I did not rake this nursery plot level; neither did I leave furrows; just left it a bit rough, and over this spread aluminum sulphate at the rate of one-half pound to a square yard, and allowed rains to wash it in.

When transplanting I always mixed a little peat into the soil at the direct point of planting and made certain that the soil was firm at the roots; then watered thoroughly. About ten days later I sprinkled soil around the transplants with cottonseed meal at the rate of one pound to twenty square feet, allowed rains to wash it in, and then to conserve moisture (these plants were now in full sun) covered with a light coating of peatmoss. Incidentally, cottonseed meal is the only fertilizer I have ever used; and I have always allowed the rain to wash it in lest surface roots by disturbed by cultivation. While Schlippenbachii transplants as readily as iris, I always took my knife and cut away a small cube of earth with each seedling.

The second winter the plants were mulched with oak leaves the same as the preceding winter, except, of course, that the screen was not used.

The following spring, the third, as soon as the leaves were removed from the nursery, another sprinkling of cottonseed meal was applied. No plants were moved until after spring growth, and again from then until August transplantings were made as necessary, always with the small cube of earth.

The third winter mulch was the same as the previous year.

This system went on until the shrubs (I now began to dignify them with that name) crowded themselves out of the nursery. Then I started planting in rows, using aluminum sulphate and cottonseed meal as in the nursery preparation. The small shrubs were now of such a size that a nice cube of earth was cut with them with a trowel now. I would note the size of the cut cube, then cut a hole in the row about 1½ or 2 inches deeper and wider; the bottom I filled with 2 inches of peatmoss and set the plant so that when firmed in, it would be level with the ground; then I filled in the sides with peat almost to the surface, and finished it off with soil. The shrubs were spaced so that the distance between them was equivalent to another shrub of the same size. Then they were watered thoroughly and covered with about one inch of peat. In winter the ground was covered with leaves as had been previously done.

Transplanting Into Borders

In a couple of years these plants were ready to be placed in borders, and each plant went into the border by the same method it had gone into the row. Of course, large cubes of earth were now cut with a spade, and the receiving hole was well loosened and made large enough to provide for a 2-inch packing of peat around the cube. A couple of years later, when the shrubs became crowded in the border, alternate shrubs were taken out and set where desired. The same method was used; but the hole left was filled with similar soil for roots of shrubs remaining in the border to work into.

These shrubs are now 6 to 7 feet high, with a large spread; all are well shaped. They were never pruned; they have been free from diseases and pests, and each spring they bloom more profusely; they never miss, no matter what the previous winter was like. We have had temperatures down to 25° below for three successive days.

The plants in the border still get a light mulch of oak leaves; not as much as formerly, because these deciduous shrubs now drop considerable foliage of their own. Specimen plants, in the open, where leaves would blow away, are given a light covering of peat over the open soil at the base. Oak leaves in the border are not removed in spring, but are left to decompose; foliage of the shrubs hides them from view and in the summer they help conserve moisture. In fact, during the summer I throw corn husks, trimmings of lettuce, cabbage, cauliflower, and bean and pea pods among these azaleas; that is, if I can get my hands on them in the kitchen before they reach the garbage can. Don't get the idea my garden is a dump. In my small space this refuse makes no impression. It dries quickly in summer, if scattered. I also use, in the same way, flower and other shrub clippings and old plants taken from flower beds in fall; and last but not least all lawn clippings when it is found necessary to rake them, being careful, however, that these clippings are *spread thinly*, not more than one inch deep.

Watering is done the same as for any other shrubs, but if the fall should be

One of Mr. Birch's home-grown specimens of Azalea Schlippenbachii.

dry I give a heavy watering before freezing. Also when watering the lawn the azalea foliage is given a fine spraying.

When working in soil in the nursery and in the rows, you *may* (note I say *may*) find that your hands feel dry. This is a sign, I believe, that aluminum sulphate has done its work and your soil is in the same condition as in woodlands. But do not be anxious to notice this or try to get your soil into this condition by over-dosing. My final plantings are not in soil like this and they do just as well; only the spot in which they were placed was treated with aluminum sulphate and cottonseed meal, as already stated. I have beautiful peonies and roses growing directly in front of my azalea borders. Soil does not have to be as acid as for the evergreen rhododendrons. During fifteen years, I have not used in one location a bit more aluminum sulphate or cottonseed meal than outlined here. *Don't over-fertilize.*

"Each spring they bloom more profusely."

Perhaps this has read like a lot of detail and too much trouble. It is not. Remember it was done a little at a time over a period of fifteen years. I can truthfully say *Azalea Schlippenbachii* is easier to grow than most perennials; and the plants grow stronger and better each succeeding year. All you need to succeed is a little patience, a routine schedule to be followed at the proper time, plus, as I have just read on another matter, "determination to meet schedule and requirements at all times."

Try this growing azaleas from seed. If you're a real gardener, you'll get real enjoyment; and, in addition, raise practically indestructible shrubs that will continue improving in flower, foliage, form, and vigor as time goes by, and if you don't find Schlippenbachii as hardy and as satisfactory as our native dogwood, I've wasted my time writing these notes. Try and you'll be surprised—agreeably.

Notices and Reviews of Recent Books

(All publications mentioned here may be consulted in the Library of The New York Botanical Garden or may be purchased on order through the Library.)

Whose Folly?

PLOWMAN'S FOLLY. Edward H. Faulkner. 161 pages. University of Oklahoma Press, Norman, Okla. 1943. $2.

The object of this book is to enlighten all and sundry of the fallacy of plowing. The author seems to be laboring under the illusion that all the evils of agriculture which stem from faulty principles of cropping and soil maintenance, such as erosion and land starvation, may be cured by discarding the plow. In its stead, he indicates, by incorporating

weeds, trash or what-have-you, preferably a crop of mature rye, into the upper few inches of the soil with the aid of the disk harrow, the immediate effect will be crop yields beyond the dreams of UNRRA. His main theme, despite the known fact that roots grow to enormous depths in the soil, appears to be that the act of plowing buries organic matter beyond their reach, thereby rendering the nutrients unavailable and irretrievable.

Mr. Faulkner blithely announces at the commencement of Chapter 1 that ". . . the moldboard plow which is in use on farms throughout the civilized world, is the least satisfactory implement for the preparation of land for the production of crops." It seems that the ancient tillers of the soil got off on the wrong foot right at the beginning, as the author contends:

". . . if a new way had been found to mix into the soil everything that the farmer now plows under . . crop production would have been so automatic, so spontaneous that there might not have developed what we now know as agricultural science. Actually, we would scarcely have needed one."

The root of the whole trouble, as deduced by the author, is that plowing under of organic matter to a depth of six or eight inches renders it useless, as:

"It must be remembered, too, that in most soils few roots ever reach the plowsole to do salvage work. The net effect, then, of this treatment is likely to be almost nil."

In the words of Mr. Faulkner, farmers plow because they like to plow and get pleasure from seeing the soil turn turtle.

Should you be the least bit skeptical of this brain-child and need proof, look around the landscape and compare the crops of the fields with the unplowed hedgerows and woods (without considering chestnut blight and other diseases that have robbed the American landscape of some of its finest uncultivated plants) for, Mr. Faulkner says: ". . trouble stops where the plow stops." As further proof of this fallacy of plowing he submits other striking parallels, for instance:

". . . our Chinese friends and the often despised peasantry of the so-called backward countries of the world can produce more per acre without machinery than the American farmer can with all his fine equipment. . . . One of the persistent puzzles has been the fact that an ignorant, poverty-stricken Egyptian who stirs his land with the ancient crooked stick can produce more per acre than his British neighbor whose equipment is right up to the minute."

Thus for himself he clinches the argument permanently. Unfortunately, the Chinese run into a food famine once in a while and why, if the poverty-stricken Egyptian, by the use of the Faulknerian formula, has been tapping ". . . the actual potentialities of the soil for producing crops," as the author asserts we have not been, does the Egyptian remain poverty-stricken?

Indulging in a little prophesying, Mr. Faulkner intimates:

"It is impossible now to foresee the economic changes which will necessarily follow this basic change in our relations with the soil. That they will be vast is certain."

It is difficult to imagine why much of the material in the book was introduced, ignoring even the theory advanced, as in many instances it is uncorrelated and even contradictory. In spots it is unwittingly humorous. Chapter 5, titled "Research" tells the story of how the old homestead was brought from a run-down condition to an excellent state of fertility strictly by conventional methods, as the "new idea" had not then been born. Fortified with the knowledge gained by this experience Mr. Faulkner, in 1930, started experimenting in a serious way to prove his revolutionary theory. Commencing with a plot of ground of pure clay he dug into it with a spade, over a period of seven years, a crop of organic matter each year, and, to quote from the record (the italics are the reviewer's), ". . . a system of introducing leaves was developed which was *very like plowing but in quite exaggerated form.*" The result of this, after yearly spading and thorough mixing, was a perfect tilth, so that the whole " . was as granular as sugar, and it could be raked about just as easily as if it had been sand." A check strip was prepared with the organic matter spaded in but left undisturbed ". . . to illustrate the normal effects of plowing . . ." and representatives of the Soil Conservation Service of the United States Department of Agriculture were called in to concur in the findings.

Evidently the representatives did not see eye to eye with Mr. Faulkner, as he says, "They did not agree with my conclusions. Neither did their superiors in Washington." The upshot of this ". . . refusal of the authorities to accept and

profit by the perfect demonstration" and ". . . stung by this flouting of an obvious point" was a bang-up field-size demonstration. Unfortunately, each year during this scientifically conducted intensive experimentation, something happened to spoil the crops, and it was an admitted failure financially and otherwise. Nevertheless, to Mr. Faulkner it proved his theory to the extent that he considered it time for publication.

Chapter 7, "Soil by Machine," in dealing with the disking of the land contains this clear-cut piece of advice (italics mine): "It might easily be that some land would be so refractory to disking that the first crop of green manure *could not be worked in at all.* This event need not stop your efforts. *Do not plow it in. Or, if you do plow it in, plow the land again immediately, and a little deeper.*"

The closing paragraph of this same chapter is clear too: "*Doubtless,* the creation of soil where none now exists, through incorporation into the surface of materials grown upon the particular area, *presents many difficulties* not touched upon in this chapter. The idea is entirely too new to have been thoroughly investigated in all of its ramifications by a single unsponsored student in a single season of work. It is extremely *doubtful,* though, that *the actual re-creation of soils presents any technical difficulties* which can not be surmounted."

Adverse weather conditions, weeds, pests and diseases are disposed of in short order simply by a twirl of the disk, though the author notes that scientific men were not inclined to agree with his assumption.

This book could possibly have been improved by the aid of a few illustrations, for instance, photographs of the author cultivating his crops after disking down his six-foot rye and one of his crops of sweet potatoes (in the upper few inches) which yielded at the rate of ". . . about twelve hundred bushels per acre."* This by the new theory.

EDWIN BECKETT,
Supt., Middletown Farm

* The United States Department of Agriculture Yearbook for 1934 gives the sweet potato yield for the State of Kentucky in 1932 as 88 bushels per acre. One wonders what Mr. Faulkner could have done had he farmed in New Jersey, which tops the list at 130 bushels.

Bushes by the Hundred

THE BOOK OF SHRUBS. Alfred C. Hottes. 438 pages, illustrated, tabular list of shrubs, index. De La Mare, New York, 1942. $3.

A compendium of information of special value for the beginning gardener, with descriptive lists of several hundred shrubs, besides a number of classified lists of shrubs for different purposes and locations. Although this edition is announced as "thoroughly revised," the only noticeable changes are a rewriting of the section on "Chemicals as an Aid to Rooting," and the addition of a couple of pages on costs and budgeting.

CAROL H. WOODWARD.

Fragrant and Savory Plants

HERBS: How to grow them and how to use them. Helen Noyes Webster. 198 pages, bibliography, index. New edition, revised and enlarged. Ralph T. Hale Co., Boston, 1942. $1.25.

Ever since Mrs. Webster's first pamphlet on how to grow herbs was issued ten years ago, her work has been acknowledged as a standard one, particularly for gardeners of eastern North America, for the growing of fragrant and savory things in the garden. The pamphlet has long since been expanded into a sizeable book, packed with the wisdom of a successful herb-grower, garnished with history, and sprinkled with the author's characteristic humor.

CAROL H. WOODWARD.

*Current Literature** *At a Glance*

Victory Gardening. Two *Miscellaneous Publications* recently issued by the U. S. Department of Agriculture are designed to be of aid to home vegetable gardeners. No. 525, which is free, is a handbook on insects and diseases, in which the troubles afflicting each crop are classified, pictures of insects are shown, methods of spraying and dusting are illustrated, and all the information is tabulated for convenient reference. No. 538, obtainable for five cents from the Superintendent of Documents in Washington, D. C., is a 40-page illustrated booklet entitled "Growing Vegetables in Town and City."

* All publications mentioned here—and many others—may be found in the Library of The Botanical Garden, in the Museum Building.

African Timber. Substitutes are the order of the day in every country. The latest Journal of the South African Forestry Association, published in Pretoria, contains an extensive article on "Some West African Substitutes for Well-Known Timbers"—these to be used in place of more than three million cubic feet of lumber formerly imported there.

African Food. Cultivated food plants and native crops that can be harvested on the continent of Africa are treated in No. 3 of a series of African handbooks published by the University of Pennsylvania Press. "The Food Resources of Africa" by Thomas S. Githens and Carroll E. Wood, Jr., contains a chapter for each of five geographical regions. The two appendices contain a tabulated survey of Africa's food resources and a list of native and introduced species, with both common and botanical names. The six-page bibliography, like the text, is arranged geographically. This 105-page book sells for $1.50.

Naturalists. The 33rd edition of *The Naturalists' Directory,* which has been appearing more or less regularly since 1877, has recently been issued by the Cassino Press in Salem, Mass. ($3). Names and addresses of scientists and amateurs in all the fields concerning natural history cover more than 150 pages. These, which are arranged by states and countries, are followed by lists of natural history museums and scientific periodicals.

Herbs. The seedling stage is shown in a drawing beside the description of the majority of the herbs in a handbook recently issued by Laurel Hill Herb Farm. Directions for culture and harvesting are given, also a number of recipes (25 cents).

Indians. Seventy-five plants, of which 37 species are useful, are listed in the monograph on the Jicaque (Torrupan) Indians of Honduras published by the Heye Foundation in New York. The author, V. W. von Hagen, has spent considerable time among these Indians, and he describes their way of life, their environment, and their language. The few remaining members of this once widespread tribe now occupy a stockaded area approximately a mile square on Montaña de la Flor at 4,000 feet altitude.

Notes, News, and Comment

Annual Report. Section Two of the Journal this month consists of the Annual Report of the Director for 1943. It also contains the yearly Report of the Treasurer, list of publications of members of the staff during 1943, special events at the Garden during the year, illustrations of some outstanding plants, plantings, and activities, and the complete roster of members of the New York Botanical Garden. Copies are being mailed with this Journal to all of the Garden's members. Upon receipt of a written request, a copy will be mailed without cost to any Journal subscriber or other person desiring to see this illustrated review of the year's activities.

Visiting Scientist. Dr. William J. Robbins spent several days last month in Madison, Wis., at the invitation of the Research Committee of the University as the "visiting scientist" for 1944. Several functions were arranged in his honor for the occasion. On Tuesday evening, March 7, Dr. Robbins gave a general lecture on "Growth Substances." The following afternoon a botanical tea and seminar took place, after which the Garden's natural-color motion picture was shown. On Thursday afternoon, March 9, Dr. Robbins addressed an agricultural seminar on growth substances with special reference to mycology. During his visit Dr. Robbins held a number of conferences with investigators and graduate students on growth and antibiotic substances and related subjects.

Pictorial Exhibit. A collection of pictures concerning the work of David Douglas, British plant explorer who scoured the great Pacific Northwest of the U.S.A. in the early 19th century, has recently been returned to the New York Botanical Garden's library after a tour of some of the regions where Douglas hunted plants. Borrowed for the Seattle Garden Club by Dorothy Fay (Mrs. Carl F.) Gould, they were shown next for six weeks in the art department of the Seattle Public Library. They then were made part of the Colonial Dames' celebration in honor of Washington's birthday, after which they were lent to a number of schools, then were shown in Tacoma at a seminary where Mrs. Gould

gave a lecture to an audience of 400 under the auspices of the D.A.R. Mrs. Gould is the author of "Beyond the Shining Mountain," a book of northwest adventures published in 1938 by Binsford & Mort in Portland, Oregon.

Wood Samples. A gift of nearly 200 samples of wood from native trees of Surinam has come to the Garden from Dr. Gerold Stahel, Director of the Agricultural Experiment Station in Paramaribo. Each sample measures 30 x 10 x 1½ cm. Dr. Stahel also collected herbarium material—leaves, flowers, and fruits—of these same trees from the Surinam jungles and has also sent these specimens to the Garden. When the wood samples are placed in the museum, each, it is planned, will bear a number to correlate it with the specimen in the herbarium.

Lectures. Dr. William J. Robbins addressed the annual dinner and initiation meeting of Tri Beta, honorary biological fraternity at Hofstra College, Hempstead, N. Y., March 3 on "What Plants Mean to the World." Dr. F. J. Seaver spoke on "Bermuda's Flowers and Scenery" and showed his natural-color slides before the Federal Plant Quarantine Club in New York March 15. Dr. Seaver also appeared before the White Plains Garden Club March 17, showing the Botanical Garden's natural-color motion picture. T. H. Everett addressed a number of groups on vegetable gardening during the early spring.

Dr. Roberta Ma spoke on "Food-Producing Plants of China" March 15, at the Teachers' Training Course given by the Brooklyn Museum.

Four assemblies at Theodore Roosevelt High School were addressed the last of March by Elizabeth C. Hall, who told of her experiences working on a Pennsylvania farm during her vacation last summer. High school students are to be recruited this year to help in harvesting farm crops.

Conference. Two talks were given at the conference of the staff and registered students of the Garden March 16, one by Dr. B. O. Dodge on "The Identity of the Fungi Associated with Boxwood Blights" and one by Dr. A. B. Stout on "The Character and Genetics of Doubleness in *Hemerocallis.*"

Meeting. The Greater New York City branch of the National Association of Gardeners met at the New York Botanical Garden the evening of March 15.

Visitors. Dr. Dorothy Parker of Cincinnati, who has been awarded two fellowships of one year each from the American Association of University Women to prepare a text on the plant geography of the United States, spent the latter half of February doing library research at the Botanical Garden. Dr. W. C. Coker, Professor of Botany, emeritus, at the University of North Carolina, worked at the Garden from Feb. 14 to 20 on the fungus genus *Pleuropus.*

Groups. The annual visit of the Parsons School of Design to the New York Botanical Garden was made on four days during the last two weeks of March, with about 16 students in each group. More than half a day was spent each time in sketching in the Main Conservatories.

Question Hour. G. L. Wittrock was the Botanical Garden's representative at a tea and question hour arranged by the Biology Department of Hunter College on March 23. The object of the affair, as explained by Dr. Jennie L. S. Simpson, who was in charge, was to answer questions of the students in such a way as "to give a boost to botany."

Pines. The arboretum of the world's pines, which was established 17 years ago at the California Forest and Range Experiment Station of the U. S. Department of Agriculture at Placerville, Calif., now contains 65 species and a number of racial varieties and hybrids which brings the total to about 100 different kinds of pines, according to R. H. Weidman, Superintendent of the Institute of Forest Genetics there. They are in groups of from 16 to 50 or more trees for each species. Some are now 60 feet tall, and nearly all have flowered, with many having been used for the past several years in hybridizing.

BROADCAST

SEEDS *which our soldiers send back to us from the distant lands where they are fighting will give us interesting new plants for our post-war gardens, Alfred Bates of Newark, N. J., told the radio audience in the New York Botanical Garden's broadcast Feb.* 25. *Mr. Bates, who is the author of a series of gardening books for beginners on annuals, perennials, and shrubs (Longmans-Green), spoke first of the need for starting plants from seed as soon as possible, in order to have the gardens we want in the post-war era. The paragraphs below have been adapted from his talk.*

WE hear a great deal about post-war planning these days. Most of it seems to concern the European nations and the development of our American cities and industries. But there is another kind which is less remote, for it affects the individual directly. This is his own personal kind of post-war planning for the better world that will start in his own back yard. . . .

In every human being there is a desire to express beauty, and for many this can satisfactorily be done through gardening. I believe that as a nation we will be more garden-conscious after the war than we have ever been before. . Right now is the time for us to plan for the gardens that we shall want after the peace has been won . . starting immediately to raise from seeds and cuttings the hardy perennials, bulbs, shrubs, and flowering trees for our post-war gardens . . For some we shall have to depend upon the kindness of friends who have in their gardens plants such as we want. But there is still another way of obtaining seeds for our post-war gardens, and that is to ask our soldiers who are overseas—or in different parts of this country—to send us seeds of plants they have liked, either in the wild or in gardens where they have been stationed.

England is noted for its lovely gardens, and many of the choicest plants in them have come there through a war. One of the best snowdrops in British gardens was sent home by a soldier who found it during the Crimean war. In the last World War a soldier sent home a form of the Madonna lily which he found growing in an out-of-the-way part of Greece, and it has proved to be a healthier form of the lily than the one we had been growing. These are only two incidents out of many. Why should not our overseas men send seeds back also? And with the seed, let them send the native name of the plant, as a matter of interest and as an aid in identifying it.

Sending seeds back will be making the evil of war serve peace and culture; and we may be sure that our soldiers will respond gladly. Published letters from the men and articles from news writers often mention the flowers in the countries where our men are stationed. In North Africa they have commented on the beauty of the strange new flowers that have come up after the winter rains. In England they have been enthusiastic over the daffodils, bluebells, and primroses of the woodland and of the beautiful gardens. They have also made gardens in strips of ground outside their camps, where not only vegetables are growing but flowers also. Even apartment-house boys from our crowded cities are finding joy and relaxation in gardening while in camp, and have become infected with the desire to keep on gardening. Let us not let them down, but have a garden started for them against the time of their return, particularly a garden grown partly from seeds that they have sent to us.

When they are home again, what memories those plants will recall to them! They will also serve to knit closer the bonds of human fellowship and brotherhood between nation and nation, for the plants will recall the kindly people in the Old World gardens whence they came, or the goodwill of the natives where the wild plants grew. Then too, there is always the chance that a new species may be brought into cultivation, to enrich the gardens of the future.

Let us then start our post-victory gardens this spring, and ask our friends in service to send us seeds when and where they can. It will be a pleasure growing the plants in preparation for the day when our men return.

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To reach the Botanical Garden, take the Independent Subway to Bedford Park Blvd. station; use the Bedford Park Blvd. exit and walk east. Or take the Third Avenue Elevated to the Bronx Park or the 200th St. station, or the New York Central to the Botanical Garden station.

PUBLICATIONS OF THE NEW YORK BOTANICAL GARDEN

Books, Booklets, and Special Numbers of the Journal

An Illustrated Flora of the Northern United States and Canada, by Nathaniel Lord Britton and Addison Brown. Three volumes, giving descriptions and illustrations of 4,666 species. Second edition, reprinted. $13.50.

Flora of the Prairies and Plains of Central North America, by P. A. Rydberg. 969 pages and 601 figures. 1932. Price, $5.50 postpaid.

Plants of the Vicinity of New York, by H. A. Gleason. 284 pages, illustrated. A handbook especially compiled for the beginner in plant identification. 1935. $1.65.

North American Cariceae, by Kenneth K. Mackenzie, containing 539 plates of *Carex* and related plants by Harry C. Creutzburg, with a description of each species. Indexed 1940. Two volumes, 10¾ x 13½ inches; bound $17.50; unbound $15.50.

Keys to the North American Species of Carex by K. K. Mackenzie. From Vol. 19, Part 1, of *North American Flora*. $1 25.

Plants of the Holy Scriptures by Eleanor King, illustrated, and accompanied by a list of Plants of the Bible with quotations, in the March 1941 Journal. 15 cents.

Food and Drug Plants of the North American Indian. Two illustrated articles by Marion A. & G. L. Wittrock in the Journal for March 1942. 15 cents.

Vegetables and Fruits for the Home Garden. Four authoritative articles reprinted from the Journal, 21 pages, illustrated. Edited by Carol H. Woodward. 1941. 15 cents.

The Flora of the Unicorn Tapestries by E. J. Alexander and Carol H. Woodward. 28 pages, illustrated with photographs and drawings; bound with paper. 1941. 25 cents.

An Herbal. First published by Richard Banckes in London. 1525. Edited and transcribed into modern English with an introduction by Sanford V. Larkey, M.D., and Thomas Pyles. 200 pages, including facsimile of original. Prepared by Scholars' Facsimiles and Reprints. 1941. Price to members of the Garden, $2.50; to others, $3.50.

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

ROSE-GROWERS' DAY

AGAIN this year the New York Botanical Garden will be the gathering place for a unique and specialized group of horticulturists—amateur home gardeners and professional nurserymen together –when Rose-Growers' Day takes place on June 13. Those who come here then to meet other growers, take part in the day's discussions, and visit the rose garden will at the same time be able to see the Garden's other fine plantings and to make or renew their acquaintance with the institution.

Again, homage will be paid to the veteran rose-grower, L. C. Bobbink, for his contributions to American horticulture and, specifically, for his sponsorship in recent years of the New York Botanical Garden's collection of roses. Mr. Bobbink has taken pride in presenting the Garden each year with hundreds of new plants—one year an exhaustive collection of hybrid perpetuals for a new border; another year a representative selection of old-fashioned roses, a class which he has done much to re-establish in American gardens; and always large numbers of hybrid teas, multifloras, and other types, the season's new introductions as well as the tried-and-true varieties, with replacements for winter-damaged plants where they were needed. And he has done more than to give these many specimens from his nursery; he has suggested attractive bedding arrangements and has conscientiously watched over the welfare of the plants. Through his personal interest, the Botanical Garden's rose garden now contains about 7,000 plants in approximately 800 varieties and species, which have been chosen with the discrimination of a connoisseur.

Studies of rose diseases which have been made at the New York Botanical Garden by and under Dr. B. O. Dodge, Plant Pathologist, have led to disease-control practices which have kept these roses through the years in remarkably good health.

The New York Botanical Garden thus is an ideal place for an eastern gathering of rose enthusiasts. The institution values this opportunity for co-operation with the American Rose Society, through its Second District, in arranging a meeting of this nature for the second successive year.

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*A Forest Lover in the Caribbee Islands**

I. On Robinson Crusoe's Isle

By J. S. Beard

THE historic castaway, Alexander Selkirk, who inspired Defoe's ageless story of Robinson Crusoe, was marooned on the island of Juan Fernandez in the Pacific. For his tale, however, Defoe chose a different setting, and from the description—"one of the islands off the mouth of the great river Oroonoque"—and from other indications we may point to Tobago as the fabled castaway's domain. Robinson Crusoe is supposed to have lived on the island before any European settlement took place; that is, before 1625. In those days the island was almost entirely covered with dense forests, for the only human visitors were savage Caribs, a partly nomadic sea people who dwelt around the coasts.

In the eighteenth century sugar was king and any West Indian planter could become rich beyond his wildest dreams. Tobago is blessed with a genial and pleasant climate and a fertile soil. Land was eagerly taken up, thousands of slaves were brought in from Africa, and great sugar plantations came into being. Sugar-cane was virtually the sole crop and was planted on all the available accessible land in the island in spite of the steep and mountainous nature of much of the country. The magnificent forests which formerly clothed the island were quickly and ruthlessly destroyed—but by good fortune not quite entirely. By common consent of the estate owners it was decided that the crest of the island's mountain backbone should remain permanently forested "for the seasons"—that is to say, for

* This is the first of a series of articles to appear in this Journal written by John S. Beard, who is assistant conservator of forests at Port of Spain, Trinidad, British West Indies. His next descriptions of the forests of the islands adjacent to Trinidad will deal with Grenada and St. Vincent. Those who have read the articles published in earlier numbers of the Journal by Henri Stehlé—one on Guadeloupe in February 1940 and one on Martinique in October 1941—will already be familiar with the names of a number of the trees that are mentioned by Mr. Beard. However, because of the strangeness of the majority of the trees to the northern reader, the common name, where one exists, is usually repeated after the botanical name of each species.

water conservation. This strip of forest along the "Main Ridge" was scrupulously preserved and later became known as the Rain Reserve.

In its heyday Tobago was one of the most valuable pieces of territory in the world, so profitable was its sugar crop. At one time during the 18th century it is said to have been seriously debated whether Tobago, which had lately been conquered by the French from the English, should not be exchanged for Canada, which had lately been conquered by the English from the French. The British Government refused to consider the exchange, which many people at the time thought a very foolish decision. Imagine how greatly the course of history might have been altered by so small a turn of events! How many people today, out of the eleven millions who inhabit Canada, have even heard of their former rival, Tobago, shrunken as she is to a little forgotten island somewhere in the south Caribbean?

Tobago today knows nothing but the ghost and the memory of former glory. After the Napoleonic Wars the West Indies lost their strategic significance. Sugar declined in value, the slaves were emancipated. One by one the estates declined and were eventually sold up, many of them being parcelled out into peasants' small-holdings among the descendants of the former slaves. Everywhere there are ruins of old sugar works and estate buildings, chimneys and windmill towers, which lend picturesqueness to a scene already enchanting.

Tobago is indeed a lovely island. Usually, it seems, the sun is shining and a strong cool breeze blowing in off the sea. The roads wind around the mountain spurs and open vista after vista of distant blue ridges and green tree-clad hills dipping toward the ever present blue, blue sea. Here it may truly be said that "every prospect pleases."

The forest-lover in search of the primeval must turn toward the Main Ridge, for the old sugar cultivations spared nothing in the lowlands. The old Rain Reserve is still there, intact, for in 1904 it was officially proclaimed a Forest Reserve and as such it is protected by law from sale and unregulated cutting. The actual Reserve contains 9,776 acres in a strip about a mile wide and twelve miles long covering the main watershed of the island. Altitudes within the Reserve range from 600 to 1,900 feet above sea-level. Natural forest is preserved also on about 4,500 acres of Crown lands which adjoin the Reserve. These are available for sale but there is little pressure on the land. Probably nearly all the forest on the Crown lands and Reserve is primeval, the land not having been cultivated or burnt over or greatly interfered with at any time.

The primeval forests are not easily reached and few visitors to the island succeed in penetrating them. For all that, a visit is well worth the time and trouble. Two good traces or mule paths cross the forests, one the St. George-Castara Road and the other the Roxborough-Parlatuvier Road, and the Cardiff Road runs up to the forest boundary at Morne d'Or. On none

Man-of-War Bay, Tobago—one of the loveliest bays in the West Indies.

of these can a car get nearer than 2½ to 4 miles and it is necessary to walk or ride the rest of the way to the forest.

Tobago is not a volcanic island and belongs structurally with Trinidad as a disconnected outlier of the continent. The flora is therefore rich and closely agrees with that of Trinidad, while there are important differences from the flora of the Lesser Antilles proper. There are about 160 species of trees and large shrubs.

The mountainous Main Ridge draws an abundant precipitation which is still fairly copious even in the dry season of January to April. The forests are therefore all tropical rain forests and they may be distinguished as three types, which have been called LOWLAND (or true) rain forest, LOWER MONTANE rain forest, and XEROPHYTIC rain forest.

Lowland rain forest is found at the lower elevations in deep moist valleys where there is greatest depth of soil and shelter from violent winds. It is known as the crabwood-angelin forest from the principal dominants, *Carapa guiancnsis* and *Andira inermis*. Other large trees which are conspicuous are *Hieronyma caribaea* (horseflesh) *Eschweilera decolorans* (devilwood), *Virola surinamensis* (wild nutmeg), *Pithecellobium jupunba* (soapwood) and *Ocotea leucoxylon* (duckwood). Smaller trees which are

confined to the lower levels of the forest include *Licania biglandulosa* (wild cocoa) and the interesting *Marila grandiflora,* endemic to Tobago and Trinidad, found along watercourses. Also *Styrax glaber, Rudgea Freemani* (another endemic to the two islands), several members of the Myrtaceae (called "small-leaf") and of the Lauraceae (called "myers"), and the extraordinary *Tresanthera pauciflora,* one of the most interesting trees in Tobago. Rubiaceous, probably endemic, and also very abundant, it is a small tree with huge leaves and long rambling branches sometimes almost recumbent.

This is a tall crowded forest with many trees reaching 120 feet in height. It is quite easy to walk about underneath, unlike the dense tropical jungle of popular conception. A number of interesting epiphytes belonging to the Bromeliaceae will be noticed, particularly *Aechmea dichlamydea* with its long branched inflorescence of bright, waxy colour in red, white and blue, and *Gravisia aquilega* with a shorter, rather heavy and club-shaped inflorescence of red and yellow. Others with pretty flower-spikes are *Guzmania lingulata* and *Vriesia longibracteata.*

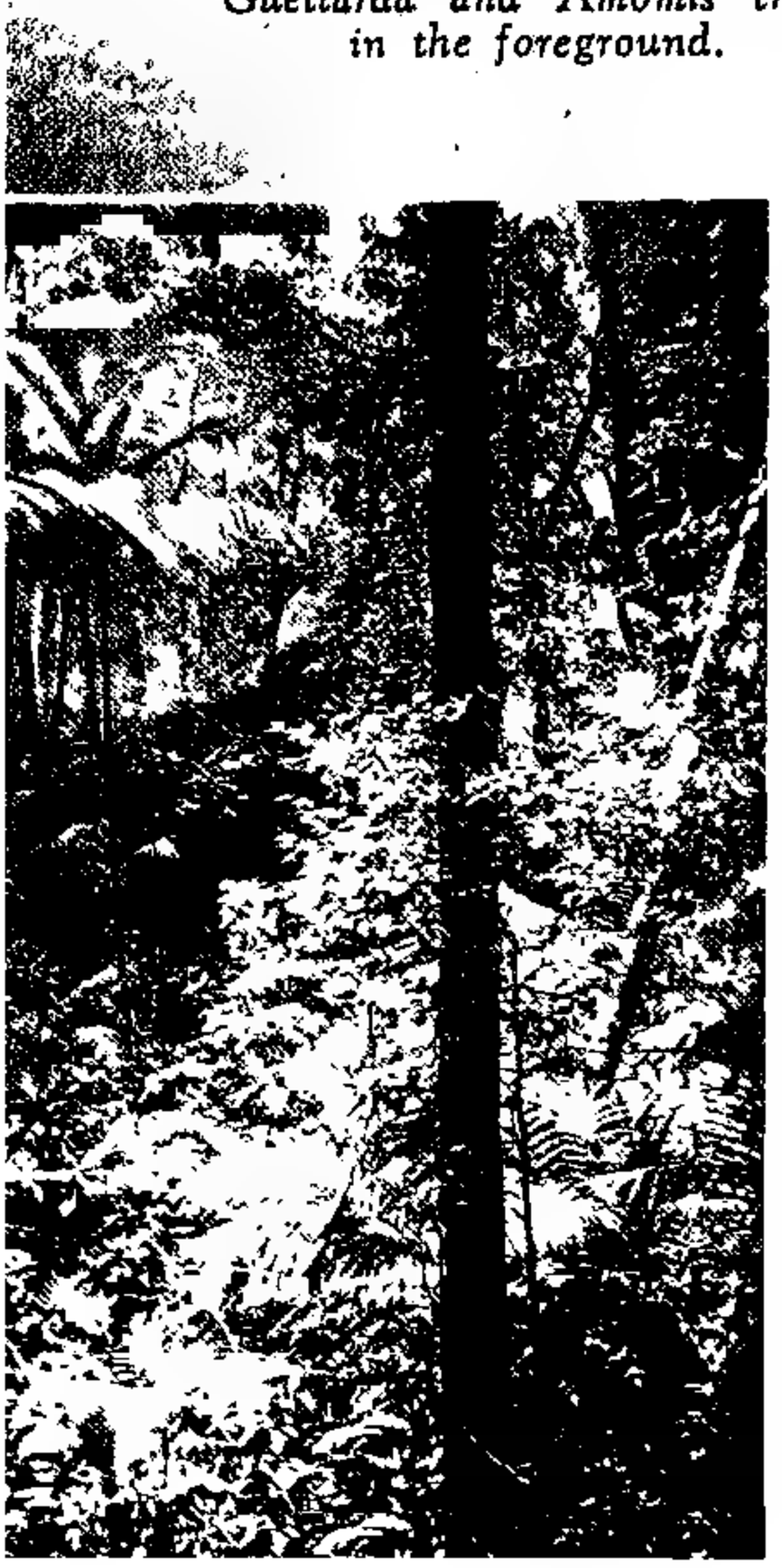
Lower montane rain forest is found on the higher slopes of the Main Ridge where the trees are exposed to strong wind. The general height of the forest is reduced to about 90 feet or even lower in very exposed places, and leaves are reduced in size. Leaves at the very top are often less than half the size of those low down on the same tree. It is quite easy to walk about beneath this forest also, as undergrowth is generally scanty. This type is called rosewood-redwood forest from the dominants, *Byrsonima spicata* and *Ternstroemia oligostemon.* Another very common dominant is *Licania biglandulosa* (wild cocoa) and other conspicuous ones are *Eschweilera decolorans* (devilwood), *Sloanea trinitensis* (lionwood), *Simaruba amara* (bitter quassia), *Erythroxylum impressum* and *Richeria grandis.* Trees of the lower storey are the same as in lowland rain forest, with the addition of a palm, a species of *Euterpe,* which is exceedingly abundant. This palm cannot at present be named with certainty: locally it is called "mountain cabbage." Along the very crest of the Main Ridge the forest is lower, *Licania biglandulosa* and *Richeria grandis* are more abundant, and *Euterpe Broadwayae* replaces the other palm.

Xerophytic rain forest is a very specialized type only found on areas underlain by igneous rock. Occasional trees may grow up to 90 feet high and 4 feet thick but nearly all the trees are quite small, not more than 1 foot thick nor over 60 feet high. They appear very crowded, like a young plantation of timber trees. The occasional large trees may be *Manilkara bidentata* (gooseberry), *Micropholis Cruegeriana, Calophyllum lucidum* (galba), *Clusia rosea* (parrot-apple), and *Podocarpus coriaceus.* Many of the smaller trees forming the bulk of the crop exhibit certain striking peculiarities. Some contain essential oils in their leaves, such as several in the Myrtle family (Myrtaceae) and *Amomis caryophyllata* (bayleaf), the

SCENES IN THE FORESTS OF TOBAGO

In the lower montane rain forest. The three large trees in the foreground are (left) Licania biglandulosa, (middle) Erythroxylum impressum, and (right) Sloanea trinitensis.

The dense pole crop in the xerophytic rain forest is shown at the right, with bark-peeling Guettarda and Amomis trees in the foreground.



Above is the deciduous forest on Little Tobago Island, with quantities of Coccothrinax palms

Luxuriant rain-forest growth.

Lu

Little Tobago Island as seen off Speyside on Tobago proper.

tree from which bay rum is made. Other trees shed their bark, either in small papery flakes or in large sheets, so that the trunk is shaggy and piles of the shed bark accumulate at the base. These trees are *Gucttarda scabra* (blue copper), species of the Myrtaceae (small-leaf), *Amomis caryophyllata* (bayleaf), *Chione venosa* and *Mouriri rhizophoraefolia*. The striking appearance of this strange, bark-shedding forest is heightened by the colour effects, for underbark newly exposed by peeled sheets or flakes of bark is brightly coloured, the colour varying from greenish-white to purple, red-brown or brilliant fleshy orange. Many trees, too, have irregularly lobed, thickened or twisted trunks. This forest is called the gooseberry—blue copper type, from *Manilkara* and *Guettarda*. There is almost no ground vegetation in it, so that it is quite easy to walk through.

Lowland rain forest is best seen above Louis d'Or, or in deep valleys not far off the St. George-Castara Road, or in the valley of the Bloody Bay River. Lower montane rain forest occurs all the way along the Roxborough-Parlatuvier Road in the Reserve. Xerophytic rain forest may be visited at Morne d'Or above the Cardiff Road or from the St. George-Castara Road

One other place of interest awaits the forest lover in Tobago, the island Game Reserve of Little Tobago lying off Speyside in the north-east part of the island. This small island was formerly private property and cotton was grown there. About the beginning of this century the owner—Sir William Ingram—decided to make it into a bird sanctuary and liberated

Terrain at the water's edge on Little Tobago, where the Turk's-cap cacti are found.

some birds of paradise brought from New Guinea. On his death the heirs made over the island to the government on condition it be maintained as a game reserve. To visit the island the permission of the Warden of Tobago is necessary, but this is readily given to bona fide visitors of whom many come every year to see the birds of paradise, for these birds have bred and multiplied on the island. No interference with them is allowed, and a supply of water is provided for them in the dry season.

There are a number of good trails about the island through the forest, which has reverted, though it is a very low and dry type, quite leafless in the dry season and known as deciduous seasonal forest. Trees reach only

about 40 feet high and many are thorny. We may note *Bursera simaruba* (naked boy), *Lonchocarpus domingensis* (dogroot), *Pisonia cuspidata* (banana wood), *Diospyros inconstans* (clean teeth) and *Pithecellobium unguis-cati* (black Jessie). In addition a most graceful palmetto, a species of *Coccothrinax*, is exceedingly abundant and lends beauty to the whole forest. There are several cactaceous climbers, and the huge *Anthurium Hookeri* is conspicuous perched on trees or rocks. On the windward slopes of the island the cactus *Cephalocereus moritzianus* is common and on steep places just above the water no trees or bushes grow: one finds a turf of *Batis maritima* with many plants of the round, red-topped Turk's-cap cactus, *Cactus Broadwayi*, named after the late W. E. Broadway, keen plant collector, who discovered it here on Little Tobago.

Rose-Growers' Day Set For June 13

THE success last year of the first Rose-Growers' Day to be arranged by the New York Botanical Garden in co-operation with the Second District (New York State) of the American Rose Society has led to plans for a similar event this year, scheduled to take place June 13.

Programs have already been mailed by the Garden to all members and by the American Rose Society to its members in the eastern states from Virginia north to Maine. The meeting, however, will not be restricted to the two organizations, but will be open to all who are interested in the culture of roses. There is no charge for registration, but for convenience in making arrangements, blanks have been printed on the program cards with the request that they be signed and returned to the Garden by persons planning to attend.

The day's events will open at 10:30 a.m., when a tour of inspection will be led by **L. C. Bobbink,** veteran rose grower, who for many years has been the donor of most of the plants in the Botanical Garden's rose garden and the watchful guardian of their welfare and appearance. An hour later, at 11:30, **Everett A. Piester,** Assistant Superintendent of Parks in Hartford, Conn., and director of the famous rose garden in Hartford's Elizabeth Park, will address the group on "The Newer Varieties of Roses: Their History and Promise." At 12 noon, Professor **L. M. Massey,** Head of the Department of Plant Pathology at Cornell University, will speak on "Control of Rose Diseases under Wartime Conditions."

For the picnic lunch, which each person is expected to bring for himself, the Garden will serve a cold drink.

At 2 o'clock the program will be resumed with a round-table discussion for rose growers. **R. C. Allen** of Harrisburg, Pa., Secretary of the American Rose Society, will be the moderator. **Paul F. Frese,** Editor of the *Flower Grower* magazine, is chairman of the Second District of the American Rose Society, which is helping to arrange the meeting.

In the event of fair weather, the entire program will take place, as last year, in the vicinity of the rose garden, which is about a ten-minute walk from the Museum Building, or a similar distance from the Pelham Parkway station on the White Plains Road line of the East Side subway. If weather is unfavorable, the program will be given in the lecture hall in the Museum Building.

Molds in the Cheese Industry

By Charles Thom

DR. THOM, who was retired recently from the Bureau of Plant Industry of the United States Department of Agriculture, spent some of his earlier years investigating the fungi that occur in cheese, as part of his task of introducing the manufacture of Camembert and Roquefort cheeses into America. This was later followed by his monograph of the genus Penicillium.

It was natural, therefore, when Dr. Alexander Fleming of London found a species of Penicillium contaminating a petri dish and inhibiting the growth of the bacteria in it, that a specimen of the fungus should be sent to Dr. Thom in Washington for determination. Dr. Thom identified it as P. notatum, and it is from this species that the drug penicillin, Dr. Fleming's discovery, is now being manufactured.

Dr. Thom's recent research has been concerned with penicillin and with fungi related to P. notatum.

"Penicillin has caught the imagination of the multitude," *he says.* "Announced as coming from a mold, it has roused more interest in molds than any previous discovery. Curiosity as to the origin of the name called attention to *Penicillium* as the mold producing it. Then someone remembered that the greenish molds on or in cheese are also penicillia. That inspired this inquiry: Why not eat moldy cheeses such as Roquefort and Camembert and get your penicillin without bothering with a fermenting process?"

But these are not known to form penicillin or any substance related to it. Even if they did, eating them would have no effect on disease germs in the human body, for penicillin is destroyed by the digestive juices. It must be administered intravenously, not by mouth. However, out of this curiosity has come this story of molds that are used in making cheese.—C.H.W.

FOR many years America depended upon France for Roquefort and Camembert cheeses, which brought the price of choice products in our market. Desultory efforts to make good cheese in America had failed. The toll of losses was long. Finally about 1903, Prof. H. W. Conn, who directed the bacteriological work of the Storrs Experiment Station in Connecticut, started a study of the two varieties. Support from the United States Department of Agriculture was added in 1904. In the period 1904 to 1915, the molds involved were isolated and described; the fundamental problems of adjusting American factory practice to mold physiology were worked out, and the resulting procedures were described and published. Supple-

mentary experiments in Washington and at several agricultural experiment stations have adjusted procedures to the specific conditions under which work is done without any new facts of fundamental importance about these mold-ripened varieties being added.

Now, just what were these problems and how were they solved?

If you are to work intelligently with a mold, you must know your mold not only as a "bowing acquaintance" in either the laboratory or the books, but in both. So to begin with, we bought high quality imported cheeses, examined them carefully for the presence and distribution of ripening agents, and isolated the fungi found. We then started to check up what was known about these molds. We found cheese-mold literature in Latin, French, German, and Italian. When we attempted to match our molds from the cheeses against the European cheese literature, we found no very tangible connection. Each writer was a law unto himself. We could not be sure what mold he had when he selected a name from the mycological literature and applied it to his organism. Neither could we be sure of the quality of the cheese he had before him. Comparison of many imported cheeses, however, showed that the mold-ripened varieties known in the American market mostly fell into two series: (1) cheeses soft in texture, covered on the outside with a rind in which the mold was a major factor; this series is typified by Camembert; and (2) cheeses showing pockets and streaks of green mold inside the mass; among these Roquefort is the outstanding example. The molds found in the two groups of cheeses were strikingly different in appearance, in habit of growth, and in their effect on the cheese. The two groups will be considered separately, but the fundamental material out of which the cheeses are made must be briefly discussed now.

The Role of Casein

The raw material for all cheese-making is, of course, milk. Its components for our purpose here may be listed as fat (butter-fat), milk-sugar, the two proteins albumin and casein, and whey, which is the watery component carrying what we know now to be very important salts. However significant the others may be, casein is the absolute necessity for cheese-making.

Disregarding technical discussions as far as possible, casein has the property of coagulating into a mass called curd when acted upon by acid, by pepsin, or by rennet. Of these, rennet is the important agent in making the mold-ripened cheeses. It is manufactured from calves' stomachs, and carries the enzyme rennin, which brings about the coagulation of the milk. Rennet, coming from the stomach of a warm-blooded animal, naturally acts most rapidly upon milk at approximately blood heat, but the cheese-maker finds the slower action at lower temperatures more useful for his purpose, since he can control the kind of curd he gets. So in the true soft

cheeses, we curdle down in the low 80's instead of at blood heat, and get a soft crumbly mass instead of the firm waxy curd produced at higher temperatures and for some cheeses often further toughened by added heat. You cannot get the smooth soft texture of a choice Camembert or the friable and crumbly mass of a Roquefort out of the waxy curd used in making Limburger or Cheddar ("store cheese"). Our curd then for these cheeses must be made from fresh sweet milk and at just the right temperature, if we are to start the cheese-ripening process with a hope of success.

Production of Camembert

Camembert cheese got its name from the Commune Camembert in northwestern France. The first factories to be famous for its production were in that neighborhood. The use of the name all over Normandy long ago superseded any local significance the name might have had at the start. Camembert is now a kind of cheese with no geographical significance to be attached to the name except that the climatic conditions in Normandy favor the kind of ripening desired.

Camembert is made in cakes usually 4 to 5 inches in diameter and about 1¼ inches thick when ripe. The diameter is not important, for sometimes they are made half size, and again under the name Brie they may be 15 inches across. A definite thickness appears to be necessary, however, because the ripening agents begin at the surface and work their way inward. If the cheeses were made too thick, the center would remain unripe, while the outside would become over-ripe and spoil.

To make half-pound cheeses, two quarts of freshly made curd are dipped slowly into each hoop and allowed to drain over night, then turned over to insure smooth sides and even drainage. By the second or third day, they are ready to salt. Each cheese is rolled in and sprinkled with salt. In America, the cheese is also sprinkled with the spores of the Camembert mold at this time. The layer of salt adhering over the whole surface quickly extracts whey, to form a shiny cover of brine which flows away. The surface is hardened somewhat by this extraction to form a rind. For some days the surface of the cheese remains sufficiently highly salted to prevent the quick development of unfavorable bacteria and of the fungus *Oidium lactis,* which would spoil this cheese. Enough salt is absorbed during this salting process to diffuse gradually through the cheese and to produce a finished or ripened product carrying about 2 or 3% of salt. When it enters the ripening process, the cheese carries between 55 and 60% of water in total solids; when fully ripe, about 50% or occasionally somewhat less.

As the cheese is draining, the desired mold germinates and develops, growing first as mycelia within the rind; then it begins to show as a white overgrowth of mycelium visible to the naked eye by the fourth to sixth day. The surface commonly begins to show a trace of gray or greenish color due to fresh spores in about ten days.

Camembert cheese at the well ripened stage when it runs from beneath its crust over the tinfoil in which each wedge comes separately wrapped. Below, a laboratory-grown specimen of Penicillium camemberti, the mold responsible for the flavor and texture of the cheese.

To obtain this type of development, the ripening rooms are held preferably between 50 and 60° F. and at a humidity of about 86 to 88%. At this temperature and high humidity, the typical mold of Camembert—*Penicillium camemberti*—will outgrow all contaminating species. If the humidity goes down, green molds, especially *P. roqueforti,* will creep in, outgrow the desired form, produce "off" flavors, and interrupt the ripening process.

In the ripening process itself, the first phase is a souring process which is complete throughout the mass. The sour curd and the salty rind hold back the oidium and the bacteria. When the Camembert penicillium has covered the rind completely and begun to produce its spores, it secretes its proteolytic enzyme into the mass. The acidity slowly disappears. The oidium and the bacteria begin to grow in the rind, and a softening process beginning just below the rind progresses gradually inward. It requires approximately four weeks for the whole mass to be softened.

The ripened product gets its soft buttery texture and mild flavor from the typical Camembert mold, *P. camembcrti.* It acquires added flavor, tending toward ammoniacal, from the constant presence of *Oidium lactis* and bacteria in the rind in the later stages of ripening. Scopulariopsis (*Penicillium brevicaule*) is often found as a contaminant and produces a very strong ammoniacal odor often noticeable throughout the cheese room and always detectable in the cheese itself by the experienced judge.

Another mold—white to yellowish-white and lacking entirely the greenish-gray spore color of *P. camcmberti*—was exploited under patents by Georges Roger. The correct name for it appears to be *Penicillium caseicolum* Bainier. It appears under various names, such as *P. candidum* of Roger, of Mazé, and of their co-workers, and *P camemberti* var. *Rogeri* Thom. The earliest correct designation, however, seems to have been given by Bainier. Cheese ripened by this mold has a firmer texture and slightly different flavor from the other. Certain makers and markets prefer the cheese made with *P. caseicolum.* because its mold, where seen, is white and this cheese is firmer in texture when ripe.

French Brie, Coulommier, and even certain makes of Neufchatel often show Camembert mold and the type of ripening characteristic of this species. Liederkranz, as it was developed in America, is made in rectangular blocks of 4 to 6 ounces each, out of curd very closely approximating that of Camembert, but is usually ripened by bacteria with the odor and flavor of Limburger. Occasionally, however, Liederkranz is found well covered with Camembert mold and approaching Camembert in quality.

The Roquefort Series

The group of cheeses showing green mold as marbling the cut face of the mass is represented most commonly by three general types: (1) Roquefort and the "Blue" cheeses approximating it, (2) Gorgonzola, and

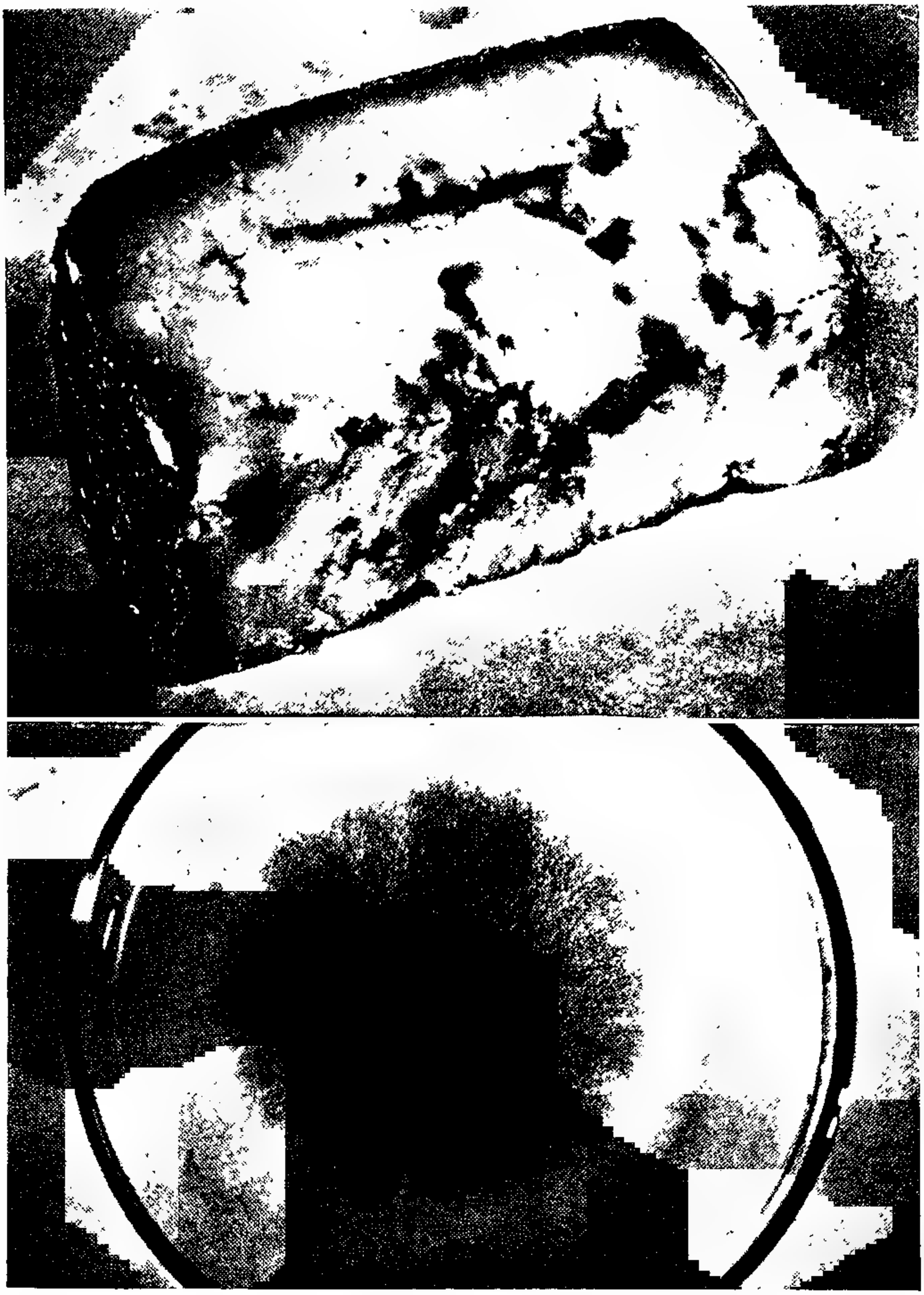
(3) Stilton. At their best, they are ripened by *Penicillium roqueforti* or some one of its variants. They are all made in larger masses which are firmer and lower in water content than the Camembert series. Curd for making the cheese is broken up into small masses or cubes and drained until the pieces which go together leave cracks or channels throughout the mass. These cracks are commonly supplemented by punch holes to insure more ventilation.

The significant factor common to these cheeses is the ability of the species *P roqueforti* to follow the cracks and holes throughout the mass, hence to bring its mycelium into close contact with all parts of the cheese. It is thus able to secrete its protein and fat-splitting enzymes into all parts of the mass. Its ability to grow throughout the mass instead of on the surface only was found to be due to its tolerance of the low oxygen tension found there—perhaps 3% of oxygen among the gases present instead of the 18 to 20% of atmospheric air. The piquant flavors found in all of these cheeses result from the fractionation of the fats to set free the higher series of fatty acids.

The differences in the three types are due to the materials used and to the handling. Roquefort originated in the sheep-raising region surrounding the village of Roquefort in southern France. It is a soft curd cheese which is set with rennet at low temperature and which retains its crumbly texture throughout. It gets special shades of flavor from its raw material, sheep's milk, the fat of which breaks up differently from that of cow's milk. However close we can come to Roquefort with cow's milk, these differences in flavor remain.

The Roquefort-makers have covered their claims to monopoly of the name with French court decisions claiming a geographical significance which is largely vitiated by the spread of Roquefort-making to all areas in southern France in which sheep's milk is available. The claim as to sheep's milk is valid. Under these French rulings, all cheese not made by the Roquefort companies must be called "Blue" cheese. It is entirely possible to produce a cheese of the Roquefort group from cow's milk, with deficiencies in flavor detectable only by the expert. Several such brands (sold as "Blue" cheese) are produced in America today. The making and ripening follow the fundamentals of the French process but it is fully recognized that American labor will not bother with milking sheep. Some cow's-milk Roquefort comes from the Argentine. Again some is good; some is made from curd that is more like Gorgonzola than like Roquefort. Both are "Blue" cheeses, but the devotee of Roquefort is not likely to accept Gorgonzola.

For Roquefort making, pure cultures of *P. roqueforti* are grown in bread until the whole center of the loaf is a mass of green spores. The loaf is then powdered for use. The powder is shaken over the mass of drained curd just before or as it is put into the hoops. It grows and pro-



"Blue" cheese made with a mold of the Roquefort series, and (below) Penicillium roqueforti, the mold from which true Roquefort cheese is made, grown in a petri dish in the laboratory. The powdery mass which covers almost the entire body of the mold consists of millions of blue-green spores.

duces spores in all the cracks and holes within the cheese even where the oxygen supply becomes often very scanty, and the freshly cut cheese shows the mold as yellow at first. It turns green rapidly when exposed to the air.

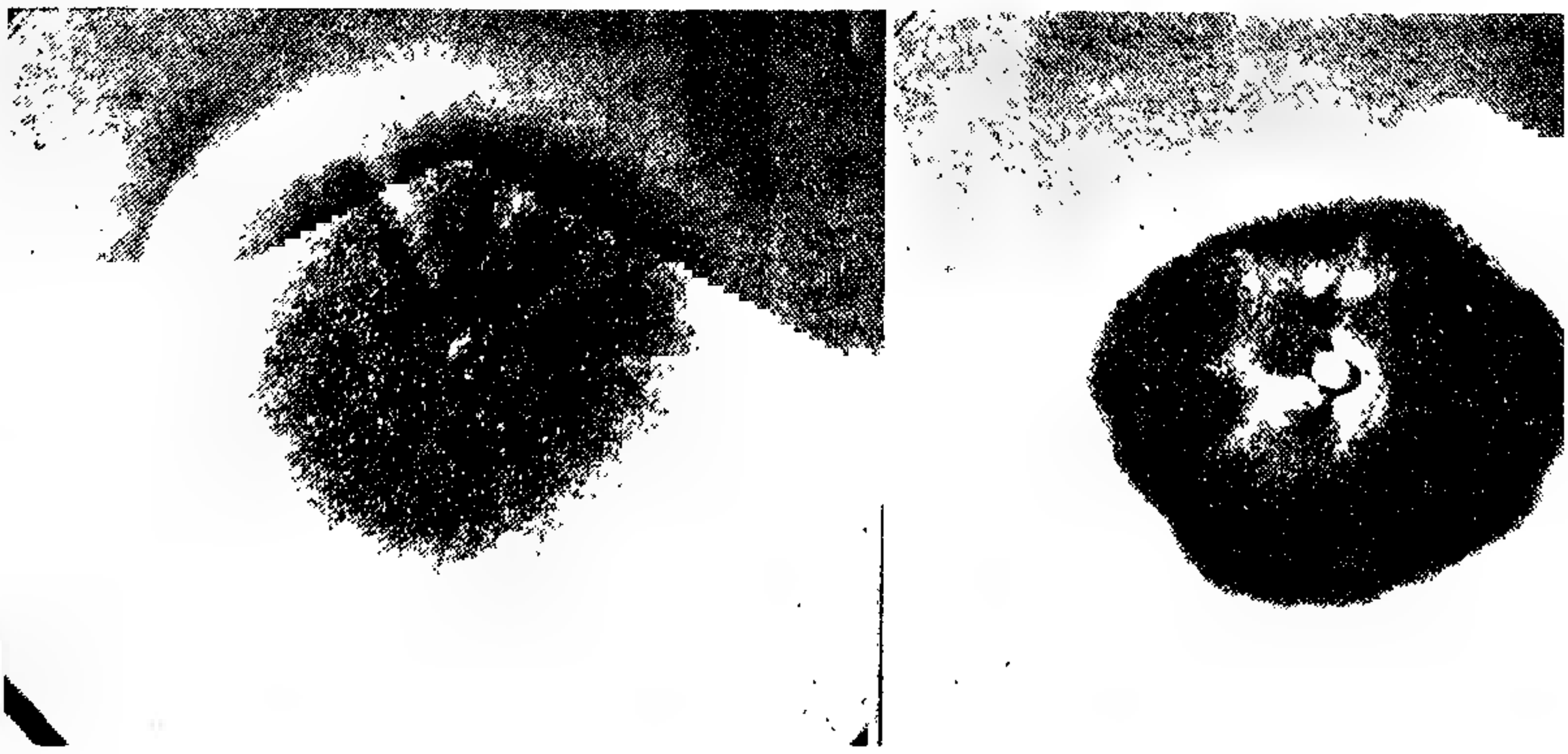
Almost entire freedom from contaminating organisms is found. Experiments showed that *Oidium lactis* was excluded by the absorption of 4% of salt in the 40% of water present through making the watery part of the cheese into a 10% brine. The other common molds were excluded by their failure to grow in the low oxygen supply found in the interior channels of the cheese.

In recent years, certain Danish dairy workers, later followed by some American dairy investigators found that green marbling like that produced by Roquefort mold could be obtained by inoculating their cheese with *Penicillium oxalicum*, a common soil organism. The cheeses so made may look like Roquefort but lack entirely the characteristic flavors produced by *P roqueforti*. The product was at first called Danish Roquefort, but it now is sold under factory labels without designating the type—hence evades the misbranding charge.

Gorgonzola is an Italian product, made from cow's milk and mostly ripened in the cool mountain valleys especially above Lecco. It is made from harder, more waxy curd, not the soft friable curd used in Roquefort. It is molded into larger cheeses, but otherwise is handled in much the same manner as Roquefort. Ripening is due to *Penicillium roqueforti* or a nearly related strain designated by Biourge as *P. gorgonzola*. As seen in Italy and in the American market, Gorgonzola lacks the uniformity in texture, in penetration by mold, in freedom from contamination that one sees in Roquefort. In the studies of Roquefort problems, Gorgonzola was more or less readily made but discarded for the more attractive product.

TWO MOLDS IN THE ROQUEFORT SERIES, FAMILIAR FOR THE CHEESES THEY PRODUCE

Left: Penicillium gorgonzola, the fungus agent in Gorgonzola cheese. Right: Penicillium oxalicum, the mold which is commonly used in the manufacture of "Blue" cheese.



Review of the American market lately shows several brands of Gorgonzola imported from the Argentine. In general these appear to be well handled. In addition, several brands of "Blue" cheese appear in which Gorgonzola curd was used instead of the friable curd of the Roquefort type. These "Blue" cheeses made to look like Roquefort except in the texture of the curd employed, are really Gorgonzola rather than Roquefort types as seen in the market.

Stilton is another hard curd type of mold-ripened cheese, which was developed in England. Imported Stilton only appears rarely in the general market in America, and the writer has not seen an American product under the name. The samples examined carried a strain of the Roquefort series. Local types of mold-ripened cheese appear in descriptive literature such as Ellischauer cheese made in a Czechoslovakian hamlet with molds belonging to a quite different section of the genus *Penicillium*. None of these types come to America. Molds as incidental growths on the surface of many types of cheese are common. Some of them are so frequent in particular varieties of cheese as to require special care for their control. Few of them damage the product beyond decolorizing or defacing the rind, or when present in openings or cracks, inducing local musty flavors.

All these cheeses are made from mammalian milk. In China, the soybean furnishes many products. Soybeans can be ground into water to form an emulsion which is known as soybean milk. The protein can then be precipitated to form a curd which is made over into cakes and eaten fresh or in salted and ripened form like cheese. In certain areas, these cakes of "cheese" are ripened by a growth of mold which becomes up to one or two inches deep in the form of long tangled white threads or hyphae. The organism is described as *Mucor sufu*. Very small quantities are imported to satisfy the occasional Chinese and Japanese customer. Few Americans go further than the beginning of acquaintance with it.

In this discussion it will be already evident that the number of molds really significant in the cheese ripening room are few rather than many. If search is extended to include numerous varieties of cheese badly made or badly handled, moldy products can frequently be found. *P casei* of Staub was thus found in black spots in Swiss cheese. *Oidium lactis* is frequent on most of the cheeses having 45% or more of water content. Long lists have been compiled to show which molds are found at least occasionally.

Among the widely known cheeses which have made their way into the great dairy markets of the world, only two series of mold-ripened varieties have made a permanent place—Camembert and Roquefort.

Woad—Once the "Universal" Dye Of Western Europe

By W. F. Leggett*

BEFORE indigo forced its way into western Europe from the East in the Middle Ages, the woad plant for many centuries supplied all the blue dye used for body stain and garment coloring.

Believed to have originated in southern Europe, the plant spread northward as far as present-day Sweden and England where, by spreading from cultivation, it became a part of the native flora. It has been recorded that it was grown in ancient times in China and in Egypt also as a source of dye.

The English word WOAD dates back to Old Teutonic, indicating the antiquity of the recognition and use of the plant in western Europe. To botanists the woad plant is known as *Isatis tinctoria—Isatis* being its ancient Greek name and *tinctoria* referring to its coloring properties. A biennial, or occasionally a perennial, the plant grows ordinarily two or three feet high after its first year, though occasionally it becomes taller. As a member of the Mustard family, or Cruciferae, it has the characteristic small, four-petaled, yellow flowers borne by so many members of that group. The fruit, however, is not a pod like that of mustard itself, but is a winged, one-seeded body somewhat resembling the fruit of the ash. The leaves, from which the dye is obtained, are more or less lanceolate with a suggestion of an arrowhead in their shape, and they are attached directly to the stem of the plant without having a stalk, or petiole.

Preparing the Dye

When the dye used to be prepared, the newly gathered, carefully selected leaves, cut off at their base, were quickly crushed or ground to pulp. It was quite early discovered that young leaves supplied a light blue, mature leaves a darker blue, and fully ripe leaves a bluish-black pigment. After crushing the pulp was placed in small heaps to drain until sufficiently dry to cohere. Then by means of hand kneading it was converted into loaf-shaped balls, each about three to five inches in diameter and weighing about five pounds. These balls were spread on wicker trays and dried for about four weeks in well ventilated sheds, prior to storage in a dry, airy place pending the gathering and processing of the entire crop, after which the complete lot was fermented. For this purpose, each ball was ground into a fine powder and the entire mass was spread to a depth of two or

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* Mr. Leggett, who has recently retired as Associate Editor of *Textile Colorist*, is now Associate Technical Editor of *Rayon Textile Monthly*. He also is the author of "Ancient and Medieval Dyes" issued this year by Chemical Publishing Co. as the first of a series of five volumes he is preparing on dyes and textiles. Articles which Mr. Leggett has previously contributed to this Journal are concerned with madder (April and May 1943) and indigo (October 1943).

three inches on the floor of an open but roofed shed. By frequent sprinklings with water, the powder was reduced to a paste in which fermentation soon began to operate. For about nine weeks this hot, steaming odoriferous mass was turned over and over and sprinkled, time and time again. This step necessitated great care, even skill, so that fermentation would be neither so slow that a bulky product would result nor so rapid that the dyeing properties would be impaired.

When fermentation had finally subsided and the stiff paste mass had sufficiently cooled, the dye was packed in casks ready for market. It was estimated that nine parts, by weight, of woad leaves yielded one part, by weight, of finished dye pigment. As the woad plant was abundant and hardy, this was considered fair return, and in average years, profit derived from it was often greater than the value of the land on which it was grown; therefore many Europeans engaged in woad cultivation. However, the introduction of indigo from India in the 16th century and of synthetic dyes in the latter part of the 19th century, reduced the use of woad to the vanishing point. The last commercial woad-grower in England abandoned his crop about a decade ago, and the plant is even rare in the wild today.

Classic References to Woad

When, almost two thousand years ago to a day, Julius Caesar's Roman army crossed the English Channel and occupied England, he found that the aboriginal inhabitants, an ancient Celtic race called Picts, meaning "painted people," punctured their skin with flint tools, and into the abrasion rubbed the blue dye from the woad plant, to form designs. In fact, it is suggested by Dr. Guest in his "Origines Celticae" that the word "Britain," the oldest national name for England, is the Latinized form of "Brython," a Celtic word meaning "painted men."

In his "Commentarii de bello Gallico" (Book V) Caesar says: "All Britons stain themselves with woad (VITRUM) which grows wild and produces a blue color which gives them a terrible appearance in battle." This statement is confirmed by Pomponius Mela (Book II) who reports: "They dye their bodies with woad (VITRUM) whether for ornament or any other reason is not known." About 70 A.D. Pliny the Elder, in his "Historia Naturalis" (Vol. XXII) undoubtedly refers to woad when he says: "There is a plant like plantain, called in Gaul GLASTUM, with which the wives and daughters of Britain smear their bodies in certain ceremonies, and go naked, being of the color of Ethiopians." The word GLASTUM used by Pliny was derived from the Celtic word GLAS which meant blue. About 3 A.D. we find Ovid in his "Amores" (Vol. II) referring to Britons as "virides," alluding to the dye with which they painted their bodies. Ovid also tells how ancient Teutons blackened their gray hair with woad. Lastly, Herodianus in the third century refers to ancient Britons as being ignorant of the use of clothes, "but they mark their bodies with various figures of

all kinds of animals, which is the reason they wear no clothes, for fear of hiding those figures." The English poet Garth, in 1715, referring by contrast to the extreme styles in dress of his day, writes:

"When dress was monstrous and fig leaves the mode
And quality put on no paint but woad."

Thus, various early references to woad as a color pigment reveal Caesar describing it as blue, Pliny reporting it as black, and Ovid referring to it both as green and black. Early writers of botanical history may therefore be excused if they express doubt as to whether the plant known to the ancient Celts and Britons as the source of blue dye was the plant we have so long known as woad. But modern scientific writers have determined that it was woad that was used from the early Stone Age by the Celts, both on the continent and after their migration westward.

Soon after the Romans had been driven from Britain by the Picts early in the fifth century, the Saxon tribes landed the first of a series of invasions. When they became settled, they found that their consumption of woad, with which they dyed their homespun cloth, was so extensive that it was necessary to bring additional shipments from their former home across the North Sea. It was the Saxons who gave us the name "woad." Though it had evidently been a part of their language since earliest times, the first recorded use of it is found in an old English "Glossary of Names of Common Objects" which was prepared about 1000 A.D.

Some Medieval Practices

A British document dated 1243 A.D. mentions duties payable on woad. Another document dated fifteen years later is an agreement made between the citizens of Norwich, England, and woad merchants of Amiens, France. Even at that early period there appears to have been some sort of a woad syndicate in Europe, and at a much later date it was utilized to combat the introduction of indigo from India—which, incidentally was far superior to woad as a blue dye. In the light of modern business practice, this association, or syndicate, can be said to have been successful, for indigo is barely mentioned in English and French records until 1581 A.D., or nearly one hundred years after the all-water route to India had been discovered and was being served by British ships. In fact, the "syndicate" appears to have had sufficient influence in some countries to obtain laws prohibiting the use of woad's competitor, indigo; and for nearly three hundred years the latter dye was forced to overcome tremendous opposition before it finally replaced woad.

Prior to the much delayed introduction of indigo from India, woad was the only blue dye used in Western Europe, and at that time woad was used more than all other dyes combined. It was the earliest European plant known to be cultivated for dye pigments and throughout many centuries it remained an important dye. In France and Saxony, where the

woad industry flourished, it was so profitable that, as early as 1339 A.D. woad dyers were organized as a distinctive trade, "woad men" being limited to certain families who even had a traditional chant of their own.

These men developed a dyeing technique which was passed from father to son, and it was early discovered that richness of the shade achieved depended on the quality and quantity of woad and also on the frequency with which the cloth was immersed in the dye bath. A fresh bath would give a deep black shade to almost every fiber fabric, and, as the solution grew weaker, it was used in turn to obtain blue and finally green. What was known as Saxon green during the Middle Ages, was cloth dyed blue with woad and afterwards yellow with weld. If madder powder was added to the solution at its weakest point, a deep purple shade was developed on the fabric, and this led to combinations with other natural dyestuffs to produce what, for that period, was a wide range of color, thus conferring upon woad the title of "Universal Dye of the Middle Ages." Yet, because of its complexity of preparation and use, woad, although providing fashionable colors, was never a cheap dye.

Woad Culture in Western Europe

In medieval times the principal woad-growing districts of Europe were Saxony and Thuringia, and because the wealth of these states was largely based on the culture and sale of woad, this plant was called "the country's gold mine." The once famous Saxon University of Erfurt was founded in the late 14th century on the profits made by the town's woad dealers. While it was true that, with more or less success, woad was cultivated in many other European countries, yet these two German states were about the only ones having sufficient quantity over local needs to export to Flanders and other important cloth-weaving centers of their times. During the 14th and 15th centuries a considerable quantity of Saxon woad appears to have been sent to France and England. Even as late as the 17th century, England continued to import the dye from abroad, although she had been growing much of her own woad for more than a century.

France made many attempts to cultivate woad, and to protect the industry and French dyers for many decades were forbidden to use the new dye, indigo, although all large cloth dyers realized that indigo possessed over ten times as much dye vitality as woad.

During the Middle Ages, when woad was the chief blue dyestuff of western Europe, supervision of the culture of dye plants was very strict. In certain countries, peasants were permitted to grow only a certain amount of woad and no dyer was permitted to buy up the "precious product" ahead of his colleagues. When peasants brought their woad crop to market it was often subjected to test prior to sale, and often was marketed, by law, only to citizens of the same town.

English Laws and Orders

During the 16th century the woad plant, by that time widely cultivated in England, was subject to some peculiar laws enacted either by royal decree or Act of Parliament. At the behest of Edward VI, in 1550 A.D., Parliament passed an Act which ordered that "not any person shall dye any wool to be converted into cloth unless the same wool be perfectly woaded."

It is recorded that Queen Elizabeth so disliked the odor which came from the fermentation of woad that she ordered that, during her "progresses" through the country she "might not be driven out of the towns by the oade infecting the air too near them." The sowing of woad plants was forbidden within five miles of any of the Queen's residences "whereby any offense may grow, from the noysome savour of the same."

The End of the Industry

After nearly twelve hundred years of supremacy as a blue dye in western Europe, woad was finally replaced by indigo; but the reign of the newer dye was brief, for only about two centuries later, indigo was replaced by man-made synthetic dyes, which have left but little field for their historic predecessors.

Notes, News, and Comment

Fellowship for Expedition. Announcement was made in April by the John Simon Guggenheim Memorial Foundation that a fellowship had been awarded to Dr. Bassett Maguire for aid in prosecution of the New York Botanical Garden Tropical Expedition of 1944.

Dr. Maguire arrived in Paramaribo, Surinam, the last of March, and, after a short period of local collecting there, left during April for a month's trip in the interior of British Guiana, where a campsite had been selected on the escarpment adjacent to Kaieteur Falls. For collecting in that vicinity, he wrote to Dr. William J. Robbins: "We'll have the gorge, the low rain forest along the river, the mixed forest on the slopes, the savannahs, and the low (2,500 ft.) mountain habitats." He is in company with D. B. Fanshawe of the British Guiana Forest Service, in a party consisting of four assistants, besides a cook, a hunter and fisherman, and, for part of the time, a boat crew.

He is to return to Surinam early in June for extended explorations on Table Mountain, necessitating a five-weeks' trip into the interior. Until lately this mesa has been virtually inaccessible because of the cliffs which face the entire mountain. "Recently," he says, "air photographs have been made, so low that even individual trees show up well. These photographs show a slide on one side that will make a comparatively easy approach.

"Table Mountain consists of coarse red sandstone, the same formation as Duida and Roraima. Evidently Table is the southernmost of the great mesas, but unlike the others in that it is not so high and has considerable rain. The vegetation is not forest, but low, shrub type. . . . Dr. Stahel is convinced that Table Mountain will yield a great number of new species and endemics."

Lilies. George L. Slate of Geneva, N. Y., Associate in Research at the State Agricultural Experiment Station there and Professor of Pomology at Cornell University, came to New York May 6

to substitute for Dr. A. B. Stout in the Saturday lecture scheduled at the Botanical Garden on "Lilies for Eastern Gardens." Breeding of lilies is a hobby of Mr. Slate's, and he is the author of a comprehensive book on lily culture, "Lilies for American Gardens," published by Scribner in 1939. A list of eleven groups of lilies, including the kinds that are most suitable for beginners, was distributed to those who attended the lecture. Copies will be mailed to Journal readers who send a three-cent stamp to cover postage.

Frame for Azaleas. Dimensions of the frame used in the culture of *Azalea Schlippenbachii,* described in the first paragraph of the article by Edward O. Birch in last month's Journal, should have been given as 9 x 18 x 2½ inches high, instead of 1½ inches. The frame was covered with a screen of one-quarter inch mesh and used for various purposes during the growth of the seedlings.

Broadcast. Traveling directions for reaching 25 places in and near New York City where spring flowers may be enjoyed were offered to radio listeners during the Garden's program presented April 21 over WNYC by Dr. John A. Small, Associate Professor of Botany at New Jersey College for Women and Chairman of Field Trips for the Torrey Botanical Club. As long as copies last, the directions will be mailed to anyone else requesting them for three cents to cover postage.

Meetings. Dr. William J. Robbins attended meetings of the American Philosophical Society in Philadelphia and, with Dr. B. O. Dodge, of the National Academy of Sciences in Washington during the week from April 21 to 27.

Tapestries. The walls of one of the largest halls in The Cloisters, branch of the Metropolitan Museum of Art in Fort Tryon Park, are again hung with the famous Unicorn Tapestries, which have been kept in vaults since the beginning of the war. They were restored to their places for the Easter season this spring. Since the Garden published its booklet on "The Flora of the Unicorn Tapestries" in 1941, by E. J. Alexander and Carol H. Woodward, in which it was stated that of the actual history of these tapestries, "only a few scattered facts are known," further studies of their origin have been made. In the September 1942 number of the Bulletin of the Metropolitan Museum of Art, James J. Rorimer, Curator of Mediaeval Art and of The Cloisters (now on leave of absence for service with the armed forces) published the results of his research. The five central tapestries, he maintains, were apparently made for Anne of Brittany to celebrate her marriage on Jan. 8, 1499, to Louis XII of France. The first and last tapestries in the series of seven are different from the other five and are known to have hung in a separate room in the ancestral castle of the Rochefoucauld family at Verteuil in the eighteenth century. Ferdinand de la Rochefoucauld was the godfather of Francis I, the son-in-law and successor of Anne and Louis XII.

Members' Days. The closing Members' Day program of the current season will take place Wednesday, June 7, at 3:30 p.m., when M. D. C. Crawford, Research Editor for Fairchild Publications, New York, will speak on "Textile Fibers from Plant Sources." The lecture will include the use of certain plant dyes and will deal particularly with the resist and mordant dyeing of cottons and, to a lesser extent, of linen fabrics, thus covering the history of calico and bringing the story of dyeing in India and Asia Minor down to date. Some textiles from the speaker's own collection will be brought to the Garden for exhibition during the program. Mr. Crawford is an anthropologist who has made extensive studies of textiles and dyes the world around. He is the author of "Art of the Ancients — A Panorama of Cotton and Other Textiles from Earliest Days" which appeared in this Journal in December 1942.

An audience of sixty heard A. C. Pfander speak on the work that goes on behind the scenes at the Botanical Garden at the Members' Day meeting May 3. Among the outstanding plants in the day's horticultural display in the Members' Room were eight orchids, among them *Oncidium crispum grandiflorum,* with chestnut-brown flowers, a native of Brazil which is shy of blooming under cultivation and is now blooming for the first time at the Garden; also *Brassia Gireoudiana,* native in Costa Rica, an unusual-looking spidery type of orchid with long-tailed yellow flowers spotted

with brown. Included in the twenty vases of cut sprays from flowering shrubs were *Lonicera tenuipes,* an early-blooming honeysuckle fairly new in horticulture; *Prunus japonica Engleri,* a rare and showy dwarf flowering cherry; *Acer macrophylla,* the Oregon maple; *Fothergilla monticola,* an attractive early-blooming shrub which is native in the South; *Enkianthus perulatus,* a rare ericaceous species from Japan; and *Stephanotis floribunda,* the Madagascar jasmine, which was blooming in the greenhouse. Also exhibited were twenty vases of named *Narcissus* varieties from the estate of Mrs. Roswell Eldridge at Great Neck, Long Island.

Horticulture. Henry F. du Pont and Marion Cruger Coffin, who comprise the Horticultural Committee of the Board of Managers, spent the day of April 27 at the Garden advising on the new azalea planting and other features.

Record Attendance. So far as actual counts have been made, the largest crowd ever recorded in a single day came to the New York Botanical Garden on Sunday, April 30, which was a sunny day of unprecedented warmth. Visitors totaling 46,400 were clocked through the gates.

Movie and Lecture. The Garden's motion picture in color was shown twice on Sunday, April 23, by G. L. Wittrock: in the afternoon before the Mamaroneck Garden Club, an Affiliate of the New York Botanical Garden, and in the evening before the Men's Club of the Methodist Church in Valhalla, N. Y. Dr. E. E. Naylor presented the film May 1 at the Bedford Park Congregational Church, near the Garden.

Dr. Roberta Ma addressed the Barnard Botanical Club April 21 on "Flower and Vegetable Gardens in China."

Conference. Dr. William J. Robbins spoke on "Nutrition of *Trichophyton gypseum*" at the monthly conference of the scientific staff and registered students of the Garden April 13.

Visitors. Mr. and Mrs. R. W. Reford, whose estate at Grand Métis on the Gaspé Peninsula has been called "one of the most remarkable in the whole Dominion of Canada," were visitors at the New York Botanical Garden May 5. Through the testing of many rare plants, Mrs. Reford has succeeded in establishing there a great many species which previously were thought to be not hardy so far north. Chinese gentians, such as *Gentiana Farreri,* form a dense lawn in her garden, covered in their season by thousands of blossoms. Mr. and Mrs. Reford inspected the Thompson Memorial Rock Garden under the guidance of T. H. Everett and Stuart Longmuir.

Dr. C. S. Hudson, sugar chemist with the U. S. Public Health Service in Bethesda, Md., and Mrs. Hudson were visitors at the Garden May 2.

Drs. Kenneth B. Raper and R. G. Benedict of the Northern Regional Research Laboratory of the U. S. D. A. in Peoria, Ill., consulted with Drs. Robbins, Seaver, and Dodge during a recent visit to the Garden.

Dr. M. S. Dunn of the University of California in Los Angeles, specialist in amino acids, spent a day in Dr. Robbins' laboratory early in April.

Dr. E. Lucy Braun of the University of Cincinnati worked in the Garden's herbarium the last week of March.

Among other visitors of recent weeks were Drs. F. W. and Virgene Kavanagh of New Brunswick, Dr. James Merry of Barnard College, Dr. John Dwyer of Albany College of Pharmacy, Alice T. Merrill, National Institute of Health, Olga A. Smith of Lawrence College, Appleton, Wisc., and Pvt. Howard Swift of the Army Air Force.

Groups. Twenty-five members of the Torrey Botanical Club visited the physiological laboratory of Dr. William J. Robbins the morning of April 8. Among other groups which have made special trips to the Garden recently have been the New York chapter of the Appalachian Club, a Girl Scout troop which visited Range 1, children from two public schools in the Bronx, a group of boys with an instructor seeking to learn about starting a vegetable garden, and 35 girls from Good Counsel College in White Plains; also the Garden department of the Bronxville Women's Club, an Affilliate of the New York Botanical Garden, serving tea in the Members' Room after a tour of the Rock Garden and Main Conservatories, and 150 guests who were entertained at tea by the Bronx Artists' Guild for the opening of the annual art exhibition in the rotunda of the Museum Building April 16.

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CAROL H. WOODWARD, Editor

A LITTLE BLUE FLOWER

A RECENT Associated Press dispatch from overseas, published in the New York Herald Tribune late last month, told of a sergeant who spent the last hour before moving up for an attack just lying in the grass and looking at a little blue flower.

Seldom has the significance of flowers *per se* been more aptly expressed than in this newspaper story. The sergeant, as quoted by the Associated Press, said, "It's funny the way you learn how good everything is. Just before we moved up last week we had to sweat out a long wait. Know what I did? For a solid hour I laid there in the grass and looked at a little blue flower. Don't know what kind it was, but I could tell you all about it. It was the prettiest flower I've ever seen, and I guess I enjoyed that hour more than any I ever spent in my life."

It is easy to prove the importance of plants to man, since he depends upon the existence of plants for the oxygen he breathes and for the food he eats. But it is not so simple a matter to express the effect on the human spirit of plants when they are seen as objects of beauty. Perhaps this is their most important function, after all. At any rate, it is because of this beauty and the uplift it gives to the human spirit that wild flowers are treasured, that trees are planted and gardens cultivated. To give such glimpses of beauty to the masses of the people, many of whom do not live in the presence of plants, is one of the reasons why an institution like the New York Botanical Garden is built, supported, and made free to the public.

All of life seems better when plants are a part of it, whether they comprise a vast garden or consist of only a little blue flower.

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A Forest Lover in the Caribbee Islands

II. On the Isle of Spice

By J. S. Beard

SOUTHERNMOST of all the high and mountainous islands in the Antillean volcanic arc lies Grenada, the "Isle of Spice." This title refers to the spices—nutmegs, cloves and cinnamon—which are an important export from the island. Grenada is one of the islands belonging to the British Windward Islands colony and is quite small—at most 21 miles long and 12 miles broad—and very mountainous. The land rises almost everywhere quite steeply from the sea to a series of peaks in the centre of the island, most of which just fall short of 3,000 feet. A big mountain, Morne Ste. Catherine, stands in the northern half of the island and in the southern half there is a system of ridges and peaks—Morne Quaqua, Fedon's Camp, Mt. Sinai and so on—arranged around a most beautiful crater lake, the Grand Etang.

Like most of the West Indies, Grenada has had an eventful history. Discovered by Columbus in 1498, it was settled in 1650 by the French who gradually extirpated the aboriginal Caribs. The last Caribs perished by throwing themselves off a cliff rather than submit, an incident which the name of the town of Sauteurs commemorates. During the 18th century Grenada changed hands several times and finally passed to the British Crown in 1783. During the unrest of French Revolutionary times there was a slave revolt under a mulatto named Fedon. The mutineers' camp was on the mountain now named Fedon's Camp and it was here that a horrible massacre of white officials and planters was perpetrated.

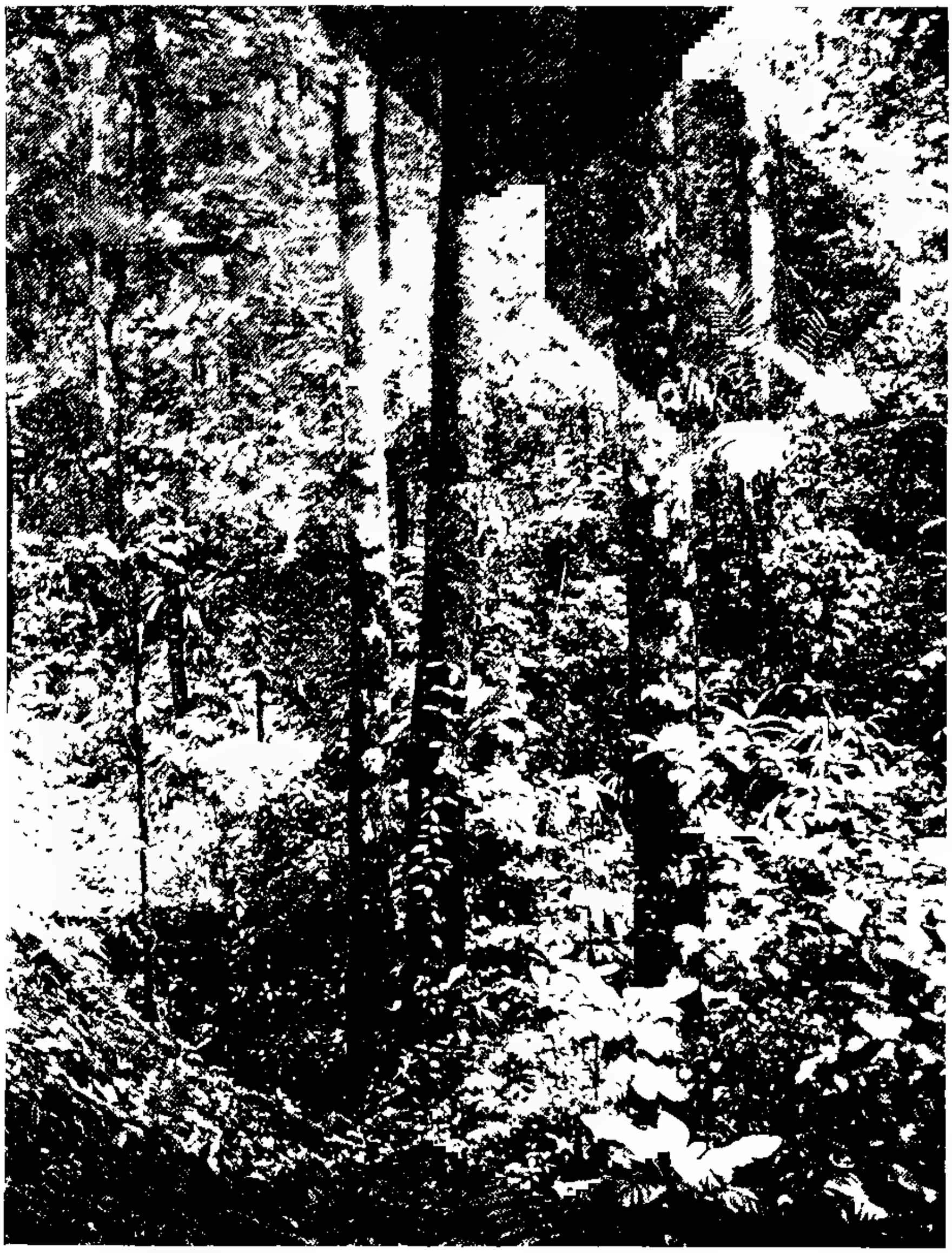
In the old days sugar-cane was universally cultivated but after the decline of West Indian sugar nearly all the land was put under cocoa, nutmegs and other spices. These are all tree crops, so that the island exhibits a well-wooded appearance and in the distance seems indeed to be covered with dense forest.

The great beauty of Grenada, to the forest lover's eye, is the Grand Etang and the mountains around it. Since the end of the last century a

In the Rain Reserve on Grenada: The Grand Etang with Morne Quaqua behind.

block of 3,000 acres of forest land has been preserved here as a Rain Reserve (for water conservation). Some of it was formerly cultivated but most has been forest since time immemorial and contains some of the finest rain forest in the whole West Indies. The Rain Reserve is easy to reach and therefore easy to explore. The main road from St. George's, the capital, to Grenville on the east coast where the airport is located winds up over the mountains and runs right through the forest, skirting the Grand Etang itself. Just at this point, too, overlooking the lake and about 2,000 feet above sea level, is a resthouse where anyone may stay on payment of a small charge. During the rainy season the place is frequently in cloud, owing to the altitude, but in clear weather, when the air is of most invigorating coolness, it is an ideal place for a holiday. The Grand Etang is a shallow mere about half a mile in diameter and occupies the former crater of some long extinct volcano. It is very pretty, all set about with trees, and the mountains sweep up all round it, one peak behind another. The whole forest may be explored from the rest house by means of series of good paths which have been cut in many directions and lead to a number of special viewpoints on the mountain tops. Probably few forests in the West Indies have been so thoroughly and so carefully opened up for visitors.

Although the area of the Rain Reserve is small, four different forest types can be recognized, and they interchange with one another rather rapidly. Three of them are classed as CLIMAX types and one SUB-CLIMAX.



The rain forest, containing some of the finest trees in the Antilles.

Throughout the area soils and topography vary little, the rainfall is very high and the climate cool. The variable factor in the habitat is the wind, which may often reach great force—though hurricanes are fairly rare in Grenada—and which exerts a generally adverse effect on vegetation in exposed places through excessive evaporation on clear days.

In the lower parts of the Rain Reserve, under the lee of some protecting ridge or mountain, a very tall rain forest is found. Higher up on the

TWO TYPES OF FOREST ON THE ISLAND OF GRENADA

Left: Montane rain forest, with gnarled trees and absence of undergrowth.
Right: Hurricane forest, with a thicket of Euterpe palms.

slopes a more stunted montane rain forest is seen, while the highest peaks are covered with a low, gnarled, and mossy elfin woodland. Some steep easterly slopes, fully exposed to gales and hurricanes, are covered only with a low secondary bush called hurricane forest. This is the sub-climax type.

The flora of Grenada has not been well collected and there is great scope for a botanist. Less than 200 species of trees and shrubs are on record, of which six are known to be endemic. The plant associations here are the same as in the other Caribbees up to the Leeward Islands group, the vegetation of all these islands being very similar.

The ***Rain Forest*** is dominated by *Dacryodes excelsa* (known as GOMMIER), a tree which exudes a whitish gum smelling very strongly of incense. Trees can in fact be smelt yards away. One tree in three in the rain forest is a *Dacryodes*. Other conspicuous trees are *Sloanea sinemariensis* and *S. Massoni*, the CHATAIGNIERS, with their large buttresses. A tall palm, *Euterpe Hagleyi*, a species endemic to Grenada, is very common and other trees are *Licania ternatensis, Simaruba amara, Cassipourea elliptica, Byrsonima coriacea, Meliosma Herbertii, Guarea macrophylla, Hieronyma clusioides*, and various members of the Lauraceae, or Laurel family. The trees of the rain forest sometimes reach 120 feet in height, and beneath

them it is dense and dark. There is little undergrowth, making passage easy, and as one walks through it is seldom difficult to spot the numerous grey monkeys which were once introduced from Africa and are now thriving here. Scarcely another vestige of wild life will be seen, for the oceanic origin of these islands has prevented their colonisation by higher animals.

The ***Montane Rain Forest*** is a very much lower forest, only some 40 feet high. The trees are correspondingly slimmer and closer together, and are often gnarled and crooked. There is much moss and a virtual absence of undergrowth. *Micropholis chrysophylloides* of the Sapotaceae is the principal species, the rusty colour of the undersurface of its leaves being very striking. Other trees are the red-barked *Richeria grandis,* a member of the Euphorbia family; *Cassipourea elliptica,* one of a small group of tropical American treés; various species of *Erythroxylum* and of the Myrtaceae, or Myrtle family, and the pretty-flowered *Ixora ferrea.*

Elfin Woodland is composed of little trees about 12 feet high, very gnarled with rambling branches pointing away from the wind, and entirely loaded with climbers, epiphytes and moss. The moss covering can be almost a foot thick at times and trailing from the stunted trees it creates a real fairy-land effect. One quite expects an elf to appear from behind every tree and it is easy to see how Schimper came to choose the name for this type of woodland. The principal species are the aralia relative, *Didymopanax attenuatum*, with large palmate compound leaves, and the brilliantly red-flowered *Charianthus coccineus.* Others include *Tern-*

The fairy-like elfin woodland, thickly draped with moss, is shown at the left, while directly above is a view at the summit of Morne Ste. Catherine (2,750 feet), where the woodland has shrunk to waist-height.

stroemia peduncularis, of the Tea family; *Richeria grandis,* which also occurs in the montane and the hurricane rain forests; a *Ficus,* a *Clusia* and *Euterpe globosa,* a palm.

Hurricane Forest covers almost all of Morne Ste. Catherine and some of the steeper windward slopes near the Grand Etang. It is a type of bush which succeeds the destruction of hurricanes and is just a dense thicket mostly composed of the palm *Euterpe globosa,* also found in the elfin woodland, along with *Trema Lamarckiana, Inga ingoides, Cecropia peltata* of the Mulberry family, *Richeria grandis* again, and species of *Ficus* and *Clusia,* typical plants of the region.

Botanizing in an Open Boat

By E. Yale Dawson*

SUMMER rains had fallen on the desert and a haze of small green things covered the ground. The smooth weathered stones were shiny from the morning shower, and as we rolled down the wet asphalt toward Nogales, we could see the sparkling rain-drops hanging from the spines of the saguaro. South of the border the desert was transfigured for a time into a region of spreading oak trees, green pastures, and little ponds between the hills. Then at Magdalena, there was dust, and great arid spaces.

My father and I were enroute to a lonely spot in the Gulf of California, with a purpose in mind totally incomprehensible to the native population. There had been one crazy American down there a few weeks before catching mice, a ridiculous vocation indeed, but to come so far and to spend good money to gather bits of seaweed from the shores of a desert island! What could be more absurd? We soon discovered it more respectable to conceal our real objective and to state that we were going to catch fish. They could understand that clearly enough, for everyone at Bahia Kino catches fish.

Kino is a tiny village in the sand dunes on the east side of the Gulf of California, reached in dry weather by means of two deep furrows running through powdered earth. In wet weather Kino is better left alone, but it was a dry July and with determination plus a lot of perspiration to which clung great quantities of the dust, the trip could be made even in a touring car. The end of the road at Bahia Kino was the nearest point of approach by land to Tiburon Island and other islands of that part of the Gulf of California. It was to El Datil that we were going, a tiny rocky ridge rising out of the sea a few miles off the distant western end of Tiburon Island

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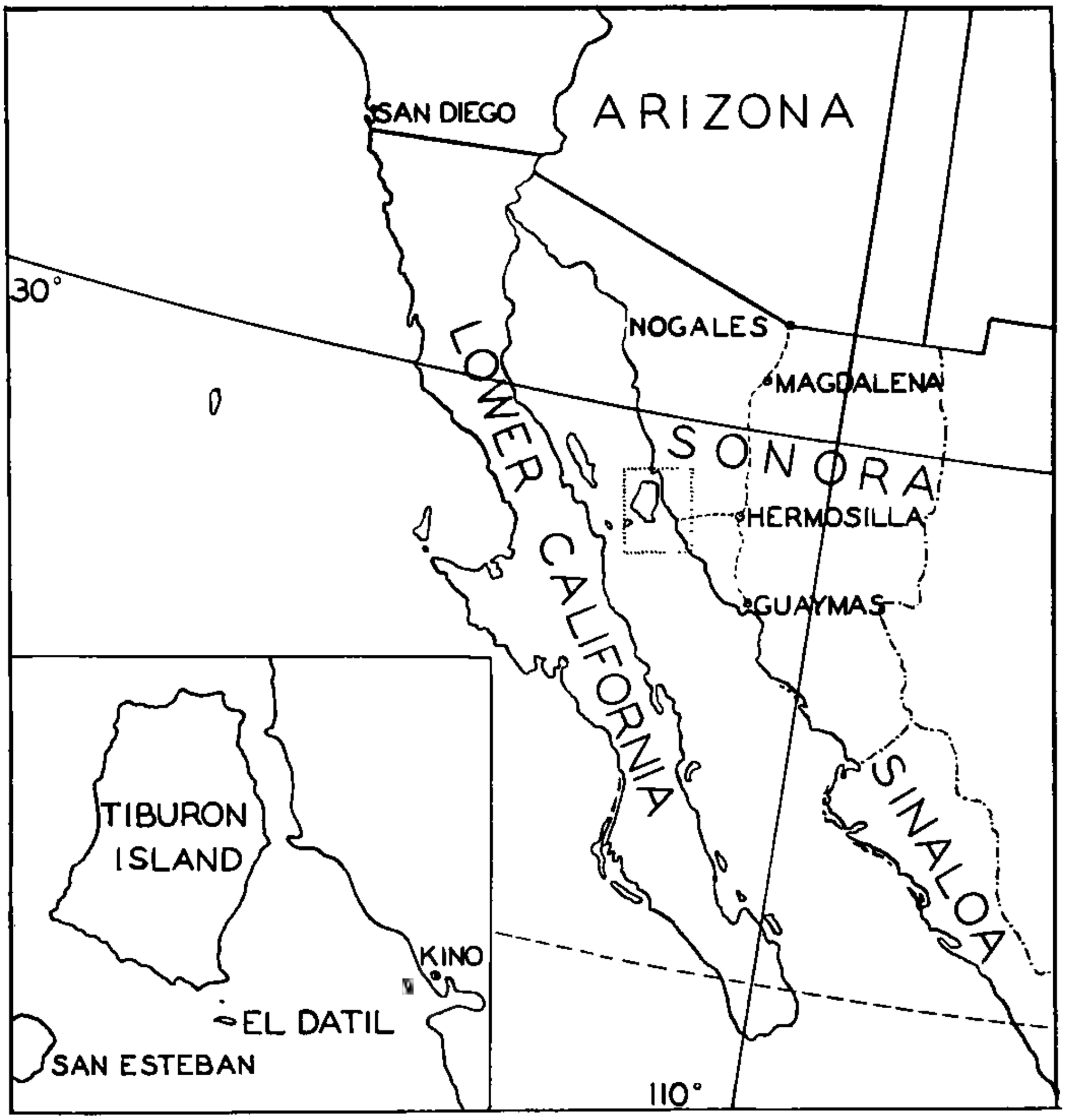


and situated, thus, near the long axis of the Gulf. El Datil was a collection station for marine algae that I had established with the Allan Hancock Pacific Expedition in January of 1940. My schedule of investigations called for a return visit to the island reef after an interval of six months in order to learn something of the nature of the seasonal alternation of marine floras in that very interesting region. The collections during January had revealed many new species and new records for science. There remained much in addition to be discovered in July at that isolated spot.

Bahia Kino on a July morning is a real tropical bay. Its waters are warmed to over 85 degrees, like those of Mazatlan or Acapulco. The surf is of gentle, lapping waves, and on the light swell there float little patches of brown sargasso weed which are slowly moved shoreward to be left on the sand. *Sargassum* is the most conspicuous and abundant seaweed in

the Gulf of California. Unlike the outer coast of Lower California, and the Pacific coast of the United States, the marine flora of the Gulf contains no true kelps (Laminariaceae) for these plants are characteristic of cold waters and are intolerant of the high temperatures developed in the Gulf during the summer months. *Sargassum,* however, is a warm-water genus, and many species are found on those shores at all seasons. In accord with our plans, we studied these plants on the Kino beach, aided enthusiastically by several little Mexican boys who gleefully scoured the shore for specimens to add to our collection. The same unsolicited assistance accompanied us to other collecting grounds, miles up the coast.

Down at the general store where the men of the village gathered to listen to the news broadcasts, we met Fernando Camou, a prosperous French-Mexican who owned an abode house with shade-trees in the yard, a fishing boat and an outboard motor. Moreover, he was intelligent enough, and knew enough English, to understand our objectives. For a hundred pesos we enlisted his services and the use of his seagoing equipment.

Early next morning, after a night of sleeping under the stars, we carried our paraphernalia down to the beach and watched it mount into a colossal pile beside the tiny one-ton craft. Fernando had brought his brother to help him, the outboard motor, a drum of gasoline, thirty gallons of water, canvas for an emergency sail, boxes of food and the like. As botanists, we had brought great numbers of bottles, boxes, buckets and other collecting apparatus as well as the personal necessities for a week's open boat voyage. Fully loaded our freeboard was slight, but we moved out across glassy water and headed north toward Tiburon Channel.

Tiburon Island is well known ethnologically because of its famed tribe of vanishing Americans, the Seri Indians. These primitive people today are very few in number and that number is diminishing rapidly. They bear many children, but few of them mature. The Mexicans say that if a Seri gets sick he is sure to die, and this is not surprising when one considers the living conditions under which they must combat the white man's diseases. A dwelling is a pit hollowed out of the sand and covered with brush for protection from the sun, or perhaps a canoe propped up for shade. Their diet is little more than an alternation between the two staples, sea turtle flesh and mesquite beans. The Seris harvest mesquite beans from the wild desert trees in the vicinity of Kino, and during the harvestless season voyage in their long canoes across the channel to Tiburon where the sea turtles abound. In the shallow bays where the turtles feed on the abundant growths of marine grass (*Ruppia maritima*) they are easily speared from the canoes, dragged up on the beach and eaten on the spot.

We had approached, in the early afternoon, the channel separating Tiburon Island from the mainland, and began seaward crossing. Typical of summer afternoons in that part of the Gulf, a wind was coming up, and by the time we had completed the channel crossing and had directed

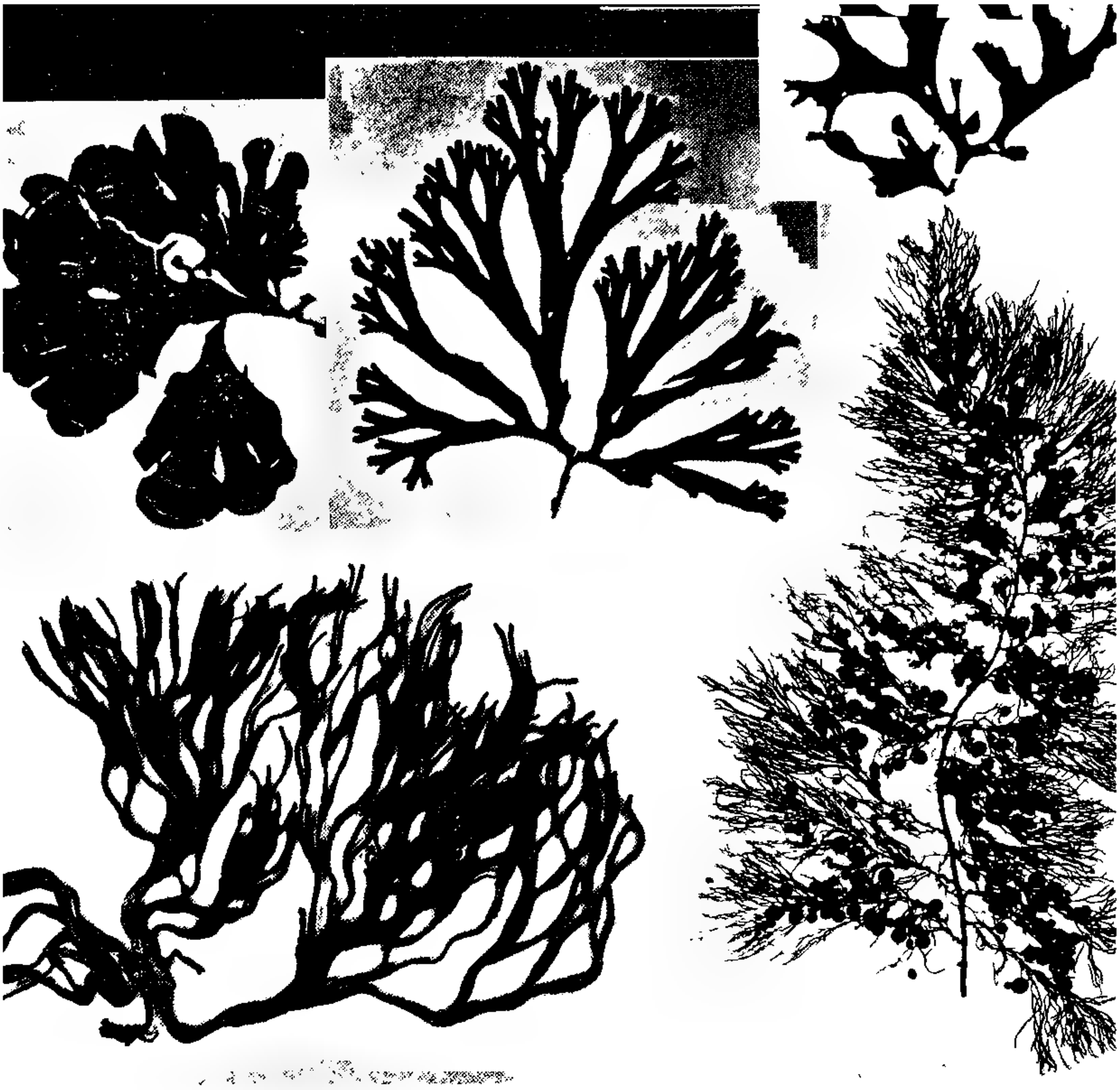
our course to the west, the headwind was driving waves over the low bow. After a time of rapid bailing while we plunged on in search of a possible beaching place, we turned toward the shore and floundered through the increasing surf to a landing. The hot wind blew (the air was 115 degrees); the July sun scorched the strand, and we sat waiting. The whitecaps were still abundant by evening, so we set about to spend the night on the beach. Fernando and Miguel stewed up some beef jerky with tomatoes and peppers, and we drank great quantities of the now tepid, sun-warmed water. As darkness fell, we stretched out on a canvas and tried to nap through the night, all the while being pestered by the beach isopods that crept over us in droves as they traveled between their seaweed food-supplies by the water and their above-tide, daylight refuge.

At dawn we opened our parched, tired eyes and groaned to see from what the tide had receded. We had planned to drag the boat down the sandy slope of the beach to the water, but the terrific tidal ebb had uncovered a rocky reef and the water had receded fifty yards beyond it. We couldn't expect to have a bottom left in the boat if we pulled it over those rocks, so we waited for the tide to return. By noon the tide was in, but, Chihuahua! The wind was blowing whitecaps again.

Through another scorching afternoon we lay in the hot, sticky sand waiting for the favor of the wind and tide. Just before dark the water became still and the tide was right. We loaded and pushed off onto a beautiful moonlit sea.

We had a long night's voyage ahead and it gave us much time for reflection and contemplation. The tide would be at its greatest ebb of the summer just after sunrise that day, and the receding waters would have removed some twenty feet from the high-tide sea surface and have laid bare a rocky reef abounding with marine life. In January this virgin ground had been explored for algae for the first time. The results were good. Now, another season had come and with it the marine environment had changed. The water temperature had changed from 60 degrees in winter to a warm 88, and that was significant. No one had yet made a study of the seasonal changes in littoral floras of the Gulf of California. This was pioneering ground.

The sun had just come up out of the sea when the prow of the boat crunched against the pebbles of the little landing cove. We had come in time and all conditions were ideal. Formalin was unloaded, jars lined up in the shadow of the rocks, notebooks brought out, and then we set to collecting. Only a very few short hours were given us to secure our samples, for at high tide the tiny island afforded no protection from the sea, and we could surely depend on the return of the afternoon wind. Hastily, but carefully we went from rock to rock and pool to pool, missing scarcely a square yard on the whole reef. Empty buckets and those full of specimens were shuttled back and forth across the reef by Fernando while Miguel moved the precious boat with the changing tide. When the



SOME ALGAE TYPICAL OF THOSE FOUND BY LIEUTENANT DAWSON IN THE GULF OF CALIFORNIA

In the upper right-hand corner is the Asiatic species, Ishige foliacea, discovered for the first time of this side of the Pacific. Below it is a characteristic sargasso weed, Sargassum piluliferum, species of which were found in abundance on the author's winter trip. Lower left is a species of Codium (C. mucronatum); above it a typical Padina, and to the right a species of Glossophora (G. Kunthii) of characteristic form. These are not the actual specimens found by Lt. Dawson, but have been selected from the herbarium of the New York Botanical Garden to show the sort of algae that he collected during his July and January Expeditions to El Datil. All are reproduced at approximately one-half natural size.

search had ended, the water was dangerously high and no time remained for sorting of specimens. We scrawled hasty notes and proceeded to fill our formalin jars with algae until the last drop was used. The wind was already beginning to blow.

Whitecaps were forming as we made off from El Datil. Our outboard was powerful, but our load had been further increased and water splashed

in with every swell. It was not long before we ceased to make any effort to keep dry. Our skins had been soaked with salt water and roughened with sand for days, so frequent drenchings were of little consequence. Moreover, we had no time for thoughts of comfort, for we had to bail that boat. We partially emptied our water cans so they would float in case of emergency.

Several hours of running at full speed against the increasing waves overheated the outboard and it sputtered to a stop. Our sail-pole and canvas were blessings then, though we nearly foundered getting them up. This expedient kept us on an even keel and making some headway while we made the motor ready for service again,—and bailed.

Through the day, as we fought wind and water, there were visions of H.M.S. Bounty and its cast-away party left to battle the sea. Then at sundown the wind abated, the waves flattened out, and under a full moon we stretched out to rest from the ordeal by water. We chugged on toward the distant, dim lights of Kino. The jars and boxes of marine specimens which now lay under us in the bottom of that little Mexican fishing boat would soon be on the laboratory tables in Berkeley. Their hastily gathered contents would be sorted and labeled with great care. Then, the microscope would take up the exploring where our sea-going botanical venture had left off.

* * *

When the notes and the collections from both the winter and the summer trip to El Datil were compared and studied, several interesting things were revealed. Although the flora as a whole was predominantly of diminutive plants at both seasons, a number of conspicuous differences were at once apparent. In January, masses of *Sargassum* plants 3 to 6 feet long covered large areas of the lower littoral shore, but in July these had disappeared and there remained only disintegrating remnants. Other conspicuous brown algae (*Colpomenia, Padina*) and the green alga, *Codium,* had disappeared to be replaced in great abundance by an entirely new element, *Dictyota.* In each season some fifty different species had been found, but examination showed only a very few of these to have been present both in winter and in summer. With the marked seasonal temperature change in the water had come an almost complete change from a winter to a summer flora, and both of these floras contained a very large proportion of Gulf endemics. Needless to say, this virgin botanical field yielded many species unknown to science.

The winter collection had revealed the presence of a particularly remarkable plant, a new species of *Cutleria,* the only member of the entire order, Cutleriales, thus far recorded from the Pacific coast of the Americas. Indeed, the only occurrence of this order beyond the Mediterranean Sea region is that of a single species known from Japan.

Not to be outdone by this, the summer trip brought to light an equally unique problem in marine plant distribution. Growing in considerable

abundance in the vicinity of Tiburon Island was a moderate sized brown alga which proved to be *Ishige foliacea,* of the Asiatic family Ishigiaceae. This species is common on the shores of China and southern Japan but had never been encountered elsewhere. The finding of so strange an inhabitant on the shores of the upper Gulf of California, seven thousand nautical miles from its greater Asiatic home, will surely remain a stimulant to much further interest in the evolution of the Gulf flora and an encouragement to the undertaking of other adventures in the exploration of this unique assemblage of marine plants.

Plant Life and the Law of Man

V. Right To Fruit On Overhanging Branches*

By E. H. Fulling

DURING the seventeenth century, English law and court cases were recorded, to a large extent at least, in both English and French, mixed together in a bilingual construction of sentences, with a smattering of Latin, which renders their reading rather tedious. In one of those cases,[1] sometime between 1614 and 1625, an English court was called upon to adjudicate a boundary dispute, and in so doing it expressed the opinion that if fruit on an overhanging branch falls to the ground on the adjoining landowner's property, the owner of the tree may enter upon his neighbor's land to gather the fruit.[2] That is the earliest recorded pronouncement in either American or English annals respecting rights in connection with fruit which overhangs adjoining property, and only four other instances of similar nature, three American and one English, appear in the records.

* * *

In America, previous to 1835, there undoubtedly were disputes respecting ownership of fruit on overhanging branches, but it is in that and the succeeding year that we read of one which passed through three courts in Connecticut.[3] It appears that for many years a pear tree had been growing a little more than four feet from the boundary between two adjoining land-owners. The tree stood wholly on the land of one of them, Lyman by name, and is reported to have been about seventeen inches in

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* Nos. 1, 2, and 3 of this series have appeared in this Journal in September 1941 and February and June 1942. No. 4, concerning barberry, currant and gooseberry, and cedar control, appeared in the October 1943 issue of *The Botanical Review,* of which Dr. Fulling is editor.

[1] Norris *v.* Baker 1 Rolle 393, 81 Eng. Rep. 559.

[2] Ann. Cas. 1918B, p. 1168, 18 A. L. R. 667.

[3] Lyman *v.* Hale 11 Conn. 177, 27 Am. Dec. 718, 4 Notes to Am. Dec. 817.

diameter, five feet from the ground. Some of its branches overhung the land of Lyman's neighbor, Hale, and in the aforementioned year Hale took the privilege of gathering six bushels of pears from those overhanging branches. In addition, he entered upon Lyman's property when the pears were ready for picking, and gathered, carried away and converted to his own use without permission twenty bushels of the fruit growing on the tree. It was an audacious adventure, indeed, and it is not surprising that Lyman soon brought suit against him for trespass and for appropriating the fruit.

In court Hale contended that he was either joint owner of the tree with Lyman, and therefore of its fruit, or exclusive owner of the pears which he had gathered. This claim was founded on the sole fact that two larger and several smaller roots of the tree had entered his land and derived nourishment therefrom; and it was supported, so Hale maintained, by two English decisions of the seventeenth century. The more important of these, so far as Hale was concerned and upon which he relied principally for his defense, was part of a ruling by the Chief Justice at a trial in 1698.[4] It stated, in part:

> "That if A. plants a tree upon the extremest limits of his land, and the tree growing extend its roots into the land of B. next adjoining, A. and B. are tenants in common of the tree."

The other authority upon which Hale depended said that a tree growing in a boundary hedge and deriving nourishment from both sides, was jointly owned by the two landowners.[5] In addition, numerous other decisions were also called upon, but since they were not directly concerned with plants we need not consider them further.

Lyman, on the other hand, asserted that the tree had grown on his property and had projected over that of Hale more than twenty-five years, that during that period he had exercised exclusive right over the entire tree and its fruit, and that since this practice had not been contested before, he was still the exclusive owner of the tree and its fruit.

The custom in Connecticut in cases of this nature had apparently been for adjoining landowners to share the crops of such boundary trees, for the judge of the county court, where this case was first tried, explained the law to the jury as follows:

> "The owner of land has not only a right to the soil, but the right, in contemplation of law, includes everything in a direct line upward to the heavens, and everything downwards to the center of the earth. The owner of the surface of the ground owns all that is over and under it. If a tree stands in the division line between two persons' lands, they are tenants in common of the tree, or are joint owners of it. If one plants a tree near the extreme limits of his land, and the roots do not extend into the land of the adjoining proprietor, he who planted it will own the whole tree, although the branches overhang and overshadow the land of the adjoining proprietor;

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[4] Waterman *v.* Soper 1 Ld. Raym. 737, 91 Eng. Rep. 1393.
[5] Anonymous 2 Rolle 255, 81 Eng. Rep. 783.

> but if the tree so planted, in growing extend its roots into the land of the adjoining proprietor, whereby it derives a portion of its sustenance from the land of both, they are tenants in common of the tree; and the universal practice in Connecticut has been for each to take the fruit overhanging his own land."

This explanation obviously was founded on those early English cases, and the judge then charged the jury:

> "In this case, the court instructs you, that if you find the roots of the tree extended into the land of the defendant, and the branches overhung it, he had a right to gather the fruit on those branches, unless the plaintiff has acquired an exclusive right by possession."

The plaintiff had not acquired any such exclusive right, so far as the case had proceeded, and there was no question about the roots having penetrated into Hale's land or of the limbs having overhung it. The jury, therefore, in accordance with the charge of the court, returned a verdict in favor of Hale, giving him possession of the fruit which he had gathered. And when Lyman appealed to a superior court, this judgment was sustained. Lyman, however, was still convinced of his exclusive right to the fruit, and he therefore brought the matter to the Supreme Court of the State, which was thus the third tribunal called upon to consider his claim.

Before that court Lyman asserted, among other arguments, that he and Hale were not tenants in common of either the tree or its fruit, as Hale contended, and that the authorities on which his opponent relied were not applicable. In those cases, he said, it was to be inferred that the trees involved actually grew in the boundary lines, which was not true in the present instance, and even if those cases were applicable, they were more than counterbalanced by other authorities, also of English jurisdiction. One of them was the case of Norris *v.* Baker which we noted at the beginning of this article, and the other was probably still earlier, being recorded as of 1620.[6] It involved a large tree which grew close to the boundary line between the properties of two adjoining landowners. The owner of the land on which the tree indisputably stood, cut the tree down and sawed it into boards on his own property and for his own use. But since some of its roots grew into his neighbor's land and there derived nourishment, the neighbor claimed some ownership in the tree and its products, and accordingly, entered the other man's land and took some of the boards. He was thereupon accused of trespassing and of carrying away property which did not belong to him. The court ruled that though some of the roots grew into his land and derived nourishment from it, the main part of the tree was on the other man's land, and therefore the entire tree belonged to the latter. It was further pointed out that the owner of the tree could not limit the growth of the roots, and it was implied thereby that their extending into adjoining territory involved no responsibility on his part.

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[6] Masters *v.* Pollie 2 Rolle 141, 81 Eng. Rep. 712.

On the strength of this ruling Lyman maintained that since the tree originally grew on his land, it was his property at the time of the trespass, that the title to the pears followed the title to the tree, and that Hale, by treating them otherwise, rendered himself liable to trespass charges. Lyman also claimed that by virtue of the length of time during which he had exercised uncontested control over the tree, he had acquired a right to have its branches continued over his neighbor's land.

The Supreme Court, in considering these arguments, was particularly concerned about the authorities upon which Hale had so strongly relied, and had the following to say about them, referring, at first, to that of Waterman *v.* Soper:

"It may well deserve consideration, whether that case is strictly applicable to the case at bar; and whether it carries the principle so far as is necessary to sustain the present defence. That case supposes the tree to be *planted* on the "extremest limit"—that is, on the *utmost point or verge of A's* land. Is it not then fairly inferable, from the statement of the case, that the tree, when grown, stood in the dividing line? And in the case cited from Rolle, the tree stood *in the hedge,* dividing the land of the plaintiff from that of the defendant. Is it the doctrine of these cases, that whenever a tree, growing upon the land of one man, whatever may be its distance from the line, extends any portion of its roots into the lands of another, they therefore become tenants in common of the tree? We think not; and if it were, we cannot assent to it. Because, in the first place, there would be insurmountable difficulties in reducing the principles to practice; and, in the next place, we think the weight of authorities is clearly the other way.

How, it may be asked, is the principle to be reduced to practice? And here, it should be remembered, that nothing depends on the question whether the branches do or do not overhang the lands of the adjoining proprietor. All is made to depend solely on the enquiry, whether any portion of the roots extend into his land. It is this fact alone, which creates the tenancy in common. And how is the fact to be ascertained?

Again; if such tenancy in common exist, it is diffused over the whole tree. Each owns a certain portion of the whole. In what proportion do the respective parties hold? And how are these proportions to be determined? How is it to be ascertained what part of its nourishment the tree derives from the soil of the adjoining proprietor? If one joint owner appropriate all the products, on what principle is the account to be settled between the parties?

Again; suppose the line between adjoining proprietors to run through a forest, or grove. Is a new rule of property to be introduced, in regard to those trees growing so near the line as to extend some portions of their roots across it? How is a man to know whether he is the exclusive owner of trees, growing, indeed, on his own land, but near the line; and whether he can safely cut them, without subjecting himself to an action?

And again; on the principle claimed, a man may be the exclusive owner of a tree, one year, and the next, a tenant in common with another; and the proportion in which he owns may be varying from year to year, as the tree progresses in its growth.

It is not seen how these consequences are to be obviated, if the principle contended for be once admitted. We think they are such as to furnish the most conclusive objections against the adoption of the principle. We are not prepared to adopt it, unless compelled to do so, by the controlling force of authority. The cases relied upon for its support, have been examined. We do not think them decisive."

The justices favored, on the contrary, the principle laid down in Masters *v.* Pollie. They held, therefore, that Lyman and Hale were not joint owners of the tree and that the charge to the jury to this effect in the lower court was erroneous. And on the remaining contention of the defendant, they said:

"It is urged by Hale that land comprehends every thing in a direct line above it; and therefore, where a tree is planted so near the line of another's close that the branches overhang the land, the adjoining proprietor may remove them. And in support of this position, a number of authorities are cited. The general doctrine is readily admitted; but it has no applicability to the case under consideration . . . the defendant gathered the pears growing on the branches which overhung his land, and converted them to his own use, claiming a title thereto. And the charge to the jury proceeds on the ground that he has a right so to do. Now, if these branches were a nuisance to the defendant's land, he had clearly a right to treat them as such, and as such, to remove them. But he as clearly had no right to convert either the branches or the fruit to his own use."

The decision of the two lower courts was thus reversed and Lyman was vindicated by finally receiving exclusive right to the fruit on his tree.

* * *

Thirty years later, in 1865, Vermont provided the next case,[7] under circumstances almost identical to those in the Connecticut instance. The plaintiff had planted apple trees on his own land, six feet from the boundary; some of their roots had extended into and some of the branches overhung his neighbor's land; the neighbor picked, carried away and converted to his own use fruit on those overhanging limbs; and the owner of the land on which the trees grew started action. Details of the case are clearly portrayed in the court's final opinion:

"Each party claims to be the sole owner of the fruit in question; the plaintiff upon the ground that he is the owner of the tree, and the defendant upon the ground that the branches and the fruit thereof overhung his land, and that in virtue of his ownership of his land he owns everything above it. It is true that whoever owns land owns above it to an indefinite height,—that is, he owns the space above, or rather, has the right to appropriate it to his use, so that no one can lawfully obstruct it to his prejudice. But it is not true in all cases that the owner of land owns everything upon or above it, though placed there wrongfully by another. Certainly in case one's personal property is wrongfully placed upon the land of another, the property in the thing is not thereby changed. The owner of the soil had his remedy by action for damages, and he may remove it; but he does not become the owner . . The defendant cannot be regarded as the owner of the apples merely because the branches on which they grew were wrongfully encumbering his ground. Suppose the defendant's counsel is correct, as he probably is, in the proposition that the defendant had the right to cut the roots and branches of the tree to the division line so far as they penetrated or overhung his land, upon the ground that they were unlawfully encumbering his premises; this justification does not extend to the carrying away and converting the apples upon such branches to his own use, unless he was the owner of the apples, either solely, or in common with the plaintiff. The title to the apples depends upon the title to the tree, and the defendant was not the sole owner of any part of the tree.

The remaining ground of justification on which the defendant relies is, that he was tenant in common with the plaintiff of the tree, and consequently of its product. A tree standing upon the division line between adjoining proprietors so that the line passes through the trunk or body of the tree above the surface of the soil, is the common property of both proprietors as tenants in common. This is not denied. This is another instance where the maxim that he who owns land owns to the sky above it, is qualified and made to give way to a rule of convenience, more just and equitable, and more beneficial to both parties. To hold in such cases that each is the absolute owner of that part of the tree standing on or over his own land, would lead to a mode of division of the tree when cut, that would be impracticable, and give the right to one to hew down his part of the tree to the line and thereby destroy the part belonging to the other. The rule is therefore settled that in such cases the parties are tenants in common. It is claimed that the same principle applies to this case, because some of the roots of the tree extend into the defendant's land whence it draws part of its support."

In support of the above argument the defendant in this case, too, had cited the principle laid down in the early English cases of Waterman v. Soper and 2 Rolle 255. Commenting upon this alleged support, the court continued:

"It is evident that neither of those cases is necessarily decisive of the case at bar, and that they do not control it, unless the principle is fairly deducible from them that the adjoining proprietors are tenants in common of a tree in all cases where the roots penetrate the soil of both, without reference to the distance of the tree from the division line. We think this broad principle is not intended to be established in those cases. In the first, Waterman v. Soper, it is a condition that the tree be planted on the *extremest limit* of the land, so that in growing it extends its roots into the land of the adjoining proprietor. A tree thus planted must almost inevitably in its subsequent growth extend its body more or less upon the dividing line. In the other case the tree grew in a hedge which divided the land of the two proprietors. Such a division hedge in England, like division fences here, is generally *prima facie* the common property of both, and the tree may have been treated as constituting part of the hedge, but if not, it must have been in close proximity *to,* if not *upon* the line. These cases may reasonably be supposed to have been decided upon the ground that the trees stood substantially upon the line, and not solely on the ground that the roots extended into the land of each. This principle of tenancy in common in a tree merely because some of its roots extend into the land of the adjoining proprietor, regardless of the location of the tree, would be attended with so much inconvenience, uncertainty and embarrassment in its practical application, that it furnishes a strong argument against the construction of these cases contended for by the defendant, as well as against recognizing such a principle unless the authorities lead to that result, or the purposes of justice imperiously demand it. There is at first view an apparent equity in the proposition that the proprietor from whose land a tree draws a portion of its support, should have some benefit in return, but to allow him an equal right to the tree and its fruits because a single root penetrates his soil, is quite as unjust as to deny him any right in the tree

[7] Skinner *v.* Wilder 38 Vt. 115, 88 Am. Dec. 645.

whatever. If he is tenant in common, what proportion does he own? If his interest is in proportion to the portion of nourishment the tree draws from his land, how is the fact to be ascertained? Suppose the division line runs through a grove, a fruit yard, a nursery of trees or a forest, and this rule is adopted, there might be a belt of land rods in width, on which the parties would be tenants in common of more or less of the trees. How is each to know or ascertain what he owns solely, and what in common, and in what proportion, especially as the rights of the parties would be constantly changing by the growth and consequent extension of roots across the division line."

The court then referred to the decisions in Masters *v.* Pollie and Lyman *v.* Hale, both of which it regarded as showing that the plaintiff in the case before it was the sole owner of the tree. And in conclusion it said:

"On the whole we think the weight of authority, reason and analogy, as well as convenience, is in favor of the principle that a tree and its product is the sole property of him on whose land it is situated; and that, considering the necessary uncertainty of evidence as to the location and extent of the roots of the tree, its location and property should be determined by the position of the trunk or body of the tree above the soil, rather than by the roots within or branches above it. But even if a tree standing with its trunk at the extreme limit of one's land, with the main roots exending immediately into the soil of the adjoining proprietor, should be regarded as so far substantially upon the line as to become common property, it cannot be so regarded in relation to the tree in question, situate six feet from the division line."

Upon the basis of this reasoning by the court, the judgment of the lower tribunal was reversed and a new trial granted.

* * *

In 1872 the same question arose in New York State.[8] Dr. Hoffman and Abner A. Armstrong were the owners of adjoining parcels of land, separated by a fence. There was a cherry tree on Dr. Hoffman's land, about two feet from the line, with limbs overhanging the fence and his neighbor's land. A sister of Dr. Hoffman, who lived with him, climbed on the line fence, by her brother's request, and attempted to pluck some cherries from one of the limbs which overhung Armstrong's land. Armstrong forbade her from so doing, and when she persisted he attempted by force to prevent her and caused her personal injury. The record does not inform us with respect to the extent of the injury, but it must have been significant, for when she brought suit against him she was awarded $1,000 and the judgment was sustained on appeal.

At the trial the defendant claimed that so much of the limbs of the tree as overhung his land, together with the fruit which they bore, belonged to him, and that the assault and battery with which he was charged were committed in defense of his possession. This defense was founded on the customarily relied-upon maxim that "he who has the soil, has it even to the sky, and to the lower depths." But the court, obviously cognizant of the latest ruling on the question, charged the jury as follows:

"Every person upon whose lands a tree stands, owns the whole of that tree, notwithstanding portions of it may overhang the lands of another, and in this case, as it is conceded that the body or trunk of the tree was wholly upon the land of Doctor Hoffman, he was entitled to all the fruit growing thereon; and hence, if the defendant attempted to prevent the plaintiff from picking such fruit, by violence, he was a wrong-doer, and this action lies against him. If he touched her at all, with the intention of preventing her from picking cherries while she was standing on the premises or fence of Dr. Hoffman, although they were upon the limbs overhanging his yard, then this action lies against him, and your verdict should be for the plaintiff."

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[8] Hoffman *v.* Armstrong 46 Barb. 337, 48 N. Y. 201, 8 Am. Rep. 537.

As already stated, the verdict was for the plaintiff, and so severe that Armstrong appealed from the Circuit Court to two higher tribunals, the Supreme Court of the State and then the Commission of Appeals. But in each the verdict was sustained, the Supreme Court holding that earlier cases showed:

> ". . . that the mere fact of the boughs or limbs of a tree planted upon the land of one man, extending to or overhanging the land of an adjoining owner, does not give the latter any right or title to any part of the tree, or to the overhanging branches, or the fruit growing thereon."

The legal maxim noted above and upon which the defendant relied, did not apply, the court held, to overhanging branches. And with obvious disapproval of the decision in Waterman *v.* Soper it recognized that there were a few cases and dicta holding:

> ". . . that where a tree standing wholly upon one man's land and so near the division line between his land and the land of another person as that a part of the roots penetrate into the land of the latter, the respective owners of the land upon both sides of the line are also tenants in common of the tree, its branches and the fruit, if any, thereon, upon the principle that the tree derives a part of its nourishment from the land of each of the adjoining owners."

"But," the court said:

> "the weight of authority is clearly the other way, and we think the doctrine should now be regarded as overruled and exploded, upon the ground as well as the insurmountable difficulties in reducing the principle to practice, as is clearly shown in Lyman *v.* Hale . . ."

* * *

There still remained the question, however, as to who owns fruit which falls on a neighbor's land. Does the owner of a tree lose his right to such fruit by virtue of his not picking it while it is still part of the tree? It appears that he does not, according to both the earliest case, Norris *v.* Baker, already cited, and the latest, also of the English courts.[9] The latter was adjudicated in 1919 and involved ten Bramley's Seedling apple trees which stood about eight feet from a boundary line, with branches overhanging the neighboring property. The owner of that neighboring property picked several bushels of fruit from the overhanging limbs and sold them, claiming the right to do so on the basis that he was privileged to lop the overhanging branches on which they grew. The owner of the trees sued for damages and was awarded £10, the value of the apples, the county court judge holding that "though a man may remove a nuisance, he cannot appropriate the materials which cause the nuisance and convert them to his own use." When the defendant appealed, the two justices of the King's Bench concurred with the judge of the lower court, and one of them very tersely established a ruling in the following words:

> "The owner of a fruit tree, the branches of which grow over the boundary of his land, is the owner of the fruit of the overhanging branches while it is still growing on the tree. It is equally his property after it has been detached

[9] Mills v. Brooker (1919) 1 K.B. 555, 9 B.R.C. 256.

from the tree, whether it has fallen from being ripe, or been blown off by the wind, or been severed by the act of man. The adjoining owner is entitled to sever the overhanging fruit in the exercise of a right of abatement of a nuisance, but the exercise of that right cannot divest the owner's right of property in the fruit so severed. It may be that the owner could not justify entering upon the adjoining land for the purpose of recovering the fruit, but as soon as the adjoining owner carries off the fruit and sells it he is guilty of a conversion and liable in damages for the full value."

* * * *

In summary, it appears to be well established now, contrary to some of the earliest pronouncements on the question, that all fruit produced by a tree not bisected by a boundary line belongs to the owner of the tree, regardless of the possibilities that some limbs and their fruit may overhang a neighbor's land, that some roots may penetrate and derive nourishment from his land, or that the fruit may have fallen on his land by natural causes.

BROADCAST

COFFEE *was the subject of William H. Ukers, Editor of the Tea and Coffee Trade Journal and author of "All About Tea" and "All About Coffee" and other books, on the Botanical Garden's radio program May* 5 *over station* WNYC. *The paragraphs below have been adapted from his talk.*

Origin of Coffee

The word "coffee" does not come from the town of Kaffa in Abyssinia, as many writers have supposed; but comes from the Arabic word QAHWAH, meaning wine. Many eastern languages have similar words referring to stimulating beverages.

The story of coffee has its beginnings in Ethiopia, where the coffee plant is native, and also in Arabia, where it was known at a very early date. Our actual knowledge of coffee is about 1,000 years old. Coffee was first mentioned in literature by Rhazes, an Arabian physician, about the year 900. But its use as a beverage dates back only about 700 years.

Legendary Tales

Two popular legends have come down to us regarding the origin of coffee. One tells of Kaldi and his dancing goats: Kaldi was an Arabian herdsman in Ethiopia who complained to the abbot of a neighboring monastery that the goats confided to his care became unusually frolicsome after eating the berries of certain shrubs found near their feeding grounds. The abbot, having observed the fact, tried the berries on himself. He, too, responded with a new exhilaration. Accordingly, he directed that some of the berries be boiled and the decoction drunk by his monks, who thereafter found no difficulty in keeping awake over their prayers.

Then there is the story of Sheik Omar and the marvelous coffee bird: Omar, a disciple of Sheik Schadheli, patron saint and founder of Mocha, facing starvation in the mountains of Ousab in Arabia, whither he had been exiled for a certain moral remissness, observed a bird of marvelous plumage come to rest in a tree, where it sang a song of incomparable harmony. When he reached for it he found on the tree only flowers and fruit. Omar filled his pockets with the fruit and went back to his cave. There, as he was preparing to boil a few herbs for his dinner, the idea came to him of sub-

stituting for this sad soup some of the harvested fruit. From it he obtained a savory and perfumed drink; it was coffee!

Adoption of Coffee-Drinking in Europe

In western Europe, it was not until the 17th century that coffee-drinking was taken up by the people. Coffee reached America during the same period. But coffee had become popular in the Near East long before that time. The first coffee-house known in the world was opened in 1554 in Constantinople. Even before that, coffee was used just enough to be under suspicion—as all new things are apt to be—so that there were persecutions and other terrific punishments dealt out to those who dared to drink the beverage. But that was mostly in the East, not in western Europe. It is true, coffee was not received entirely with favor in the western nations, but nothing really drastic occurred. It was accused of aiding and abetting the French Revolution in the coffee houses of Paris, and the American Revolution in the coffee houses of Boston, also of New York and Philadelphia; and it was suppressed for a while in Germany and in England, whereas tea was never submitted to any such indignities. On the other hand, as early as the close of the 15th century, we find coffee being baptised as a truly Christian beverage by Pope Clement VIII.

Coffee was introduced into England at Oxford by Conopios, a Greek, in 1637, and here, too, at Oxford, the first English coffee house was opened in 1650.

By 1657, when tea was first sold publicly in London, England had already become the greatest coffee-drinking country in the world. Only a little later, 2,000 coffee-houses could be counted in London alone. But that was before the East India Company became interested in tea and started its successful campaign to turn Britons over from coffee drinkers to tea drinkers.

America, on the other hand, you know, started out to be a nation of tea drinkers; it was the unjust tea tax and the Boston tea party that cast the die for coffee. So, today, the tea and coffee habits of the two countries are almost reversed; England drinks about 11 times as much tea as coffee; America drinks about 21 times as much coffee as tea.

Austrian coffee-drinking dates from one of the most romantic tales in the history of the art. When Franz George Kolschitzky, the great Brother-Heart, hero of the Turkish siege, saved the city in 1683, for his reward he received the sacks of coffee left behind by the fleeing Turks. With them he opened the first coffee house in Vienna and taught the Viennese the art of coffee making.

Sources of Coffee

While coffee is native to Ethiopia, very little or none was ever raised there on a commercial scale for export. The cultivation of coffee spread rapidly in the 17th and 18th centuries from there to Arabia, Southern India, to Ceylon, to Java, and other islands of the Netherlands Indies, and then, by way of Martinique, to South and Central America and Mexico. There is a charming story about Capitaine De Clieu, French naval officer, who sailed from France in 1723, accompanied by one of the seedlings of a Java coffee tree presented to Louis XIV, and who shared his drinking water with it in order to bring it safely to Martinique, where it became the progenitor of most of the coffee trees in the New World.

Coffee in America

Coffee was first introduced into America in 1668. Captain John Smith was the first to bring a knowledge of coffee to America. This was in 1607. He became familiar with it during his travels in Turkey. But the earliest reference to the use of coffee as a beverage is at New York in 1668.

Different Kinds of Coffee

Coffee is a shrubby plant with rather attractive small white blossoms that are fragrant. Its botanical name is *Coffea arabica*, and it is a member of the Madder family.

The coffee of commerce, of course, has a number of relatives and some of these are used for commercial production too, on a smaller scale than *Coffea arabica.* There is *Coffea liberica,* for example, which can be grown in more tropical regions and which produces a fine-flavored bean. Another is known as *Coffea robusta*—its name tells its own story. Then there is the one called *madagascariensis;* this is a nearly caffeine-free coffee which grows wild in Madagascar and in the nearby Comoro Islands off the coast of Africa.

Most of the caffeine-free coffees, however, are specially prepared. The caffeine is eliminated by softening the green beans under steam pressure, then extracting it by applying certain solvents to the softened coffee.

Coffee that we buy is usually blended from a number of different types or varieties of coffee, but several may be used straight, such as Mocha coffee, when it is served as an after-dinner drink; also some Brazils, Colombians, and Puerto Ricans. Any of these may also be blended with the fancy mild types—that is, the coffees produced mainly in countries other than Brazil.

Mocha coffee is really considered one of the best; in flavor it is smooth and delicious. However, the supply is very limited, and there are many other coffees equally desirable. It comes from the Mountains of Yemen in Arabia, getting its name from the former important coffee port on the Red Sea coast of Arabia, which has been closed by a sandbar for over 100 years. It is now shipped through the ports of Hodeidah and Aden.

Java coffee originated in 1696, when the first coffee plants were introduced into Java from Malabar, India. They were grown from the seed of *Coffea arabica* carried directly to Malabar from Arabia.

Brazils are of great importance to coffee drinkers of North America. These are the coffees grown in São Paulo, Minas Geraes, Bahia, Paraná, Victoria, and other sections of Brazil. They may be used straight but usually they are blended with the milds, which are, as I said, coffees produced in countries other than Brazil.

The Coffee Situation

Before the war we used to get large amounts of coffee from the Netherlands Indies, but today 80% of the coffee consumed in the United States comes from Brazil and Colombia. Brazil is the world's greatest coffee-producing country. In the Americas the product is also grown mainly in El Salvador, Guatemala, Venezuela, and Costa Rica.

I believe that never again shall we have to face coffee rationing in the United States. Coffee will continue as the drink of democracy, an indispensible beverage of all those nations dedicated to the arts of peace, and these must rule the World of Tomorrow.

The Roasting of the Bean

Answering a subsequent question, off the air, regarding the date of discovery of the value of roasting coffee before brewing it, Mr. Ukers said:

About 1200 it was discovered that roasting the dried hulls of the coffee beans improved the flavor of the decoction, previously made from dried hulls alone. This drink became known as CAFE A LA SULTANE, or KISHER, and it continues in favor today in Arabia.

The practice of roasting the dried beans in crude, burnt clay dishes (after the pulp had been stripped away in the preparation of the beans, or seeds, for market) started among the Arabs sometime in the 13th century.

Before coffee became a beverage it was used first as a food, then as a wine, a medicine, a devotional refreshment, and a confection.

How to Make Coffee

Another question answered off the air was:

"What do you consider the proper way to make coffee?"

Mr. Ukers replied: Buy a good grade of coffee and make sure it is properly ground for the brewing device you prefer. Make it in a French drip pot or in some filtration device where freshly boiling water is poured through the grind but once. Never boil coffee.

Notes, News, and Comment

Boyce Thompson Institute. Dr. William J. Robbins was elected a member of the Boyce Thompson Institute on May 24, and also a member of the Board of Directors of the Institute. He succeeds Dr. R. A. Harper.

Herb Society. The annual meeting of the New York chapter of the Herb Society of America took place at the New York Botanical Garden May 18. Between the business meeting and the tea which was served in the Members' Room, the Garden's motion picture was shown to the group.

Quinine Hunt. The latest word from Dr. W. H. Camp came from the junction of the Río Pastaza and the Río Topo in eastern Ecuador, where he has joined the search for wild stands of cinchona trees with which to increase the immediate output of quinine.

Lectures. Dr. William J. Robbins addressed the Pre Medical Society of Columbia University May 24 on penicillin. Dr. Frances E. Wynne explained the making of botanical kodachrome film slides to members of the New York Microscopical Society May 5. Dr. A. B. Stout spoke on "Loss of Incompatibilities in Tetraploid Petunias" before the Torrey Botanical Club meeting at the Garden May 17. Dr. H. A. Gleason addressed the Garden's Advisory Council May 8 on the progress of work on the flora of northeastern North America. G. L. Wittrock spoke May 24 on "Food and Drug Plants of the American Indians" to 30 patients who comprise a garden club at the Tri-Boro Tuberculosis Hospital on Long Island, where Mrs. Carl Noble of Forest Hills is a volunteer instructor in gardening therapy. Dr. Roberta Ma gave an illustrated lecture entitled "Nine out of Ten are Farmers" before the China class sponsored by the East and West Association May 23. During a vacation trip in North Carolina the last of May, Dr. F. J. Seaver addressed the Marion Garden Club and the Rotary Club there on the activities of the New York Botanical Garden. Before returning to New York he worked in the herbarium at Duke University and the University of North Carolina.

Visitors. Mrs. Inez M. Haring of Poughkeepsie came to New York May 25 to spend six weeks working in the Elizabeth Gertrude Britton Moss Herbarium at the New York Botanical Garden. Captain Stanley J. Smith of the Ordnance Department of the United States Army, now on leave of absence from Cornell University, spent several days the last of May in the herbarium, studying specimens of the flora of south-central New York. Dr. A. J. Grout stopped at the Garden late in May on his way north from Florida. Mulford B. Foster of Orlando, Fla., who was in New York to address the Garden Club of America during its annual meeting, spent May 16 at the Garden. Other visitors of recent weeks have included William W. Diehl of the U.S.D.A. in Washington; Josiah L. Lowe of Syracuse University; L. J. Brass and G. H. H. Tate of the American Museum of Natural History; R. Bloch of Lederle Laboratories; Benjamin M. Duggar, Lederle Laboratories; Marion A. Johnson of New Brunswick; John B. Woodward of Bridgeport, Conn.; and Frank Egler of New York City.

Groups. The Greater New York City branch of the National Association of Gardeners, of which Anne O. Seaman of the Botanical Garden is secretary, toured the new azalea and rhododendron plantings at the Garden May 17. The Garden Department of the Scarsdale Woman's Club visited the rock garden, perennial borders, and peony planting the morning of May 11. Public Schools 20, 76, and 124 in the Bronx have sent classes of children to visit the indoor and outdoor displays in recent weeks.

New Position. John King, who has been a gardener at the New York Botanical Garden since 1931, resigned the middle of April to accept a position at a private estate on Long Island. Most of Mr. King's work has been in Range 1, and during the past eight or ten years particularly he has been largely responsible for the attractive arrangement of the plants in the Flower Display House.

Nature Curators. The New York Botanical Garden was represented by Carol H. Woodward at the annual Nature Curators Congress of the New York City public schools, held at the American Museum of Natural History April 27. The principal address was given by F. F. Rockwell, who illustrated his subject of "Deep versus Shallow Soil Preparation" with kodachromes taken in his own garden in Rockland County, N. Y.

Advisory Council. Elizabeth C. Hall addressed the Advisory Council of the Botanical Garden April 3 at the home of Mrs. Harold I. Pratt on the unique services of the Botanical Garden's library.

Radio Programs for Summer

FOUR BROADCASTS are scheduled by the New York Botanical Garden over station WNYC at 3:30 p.m. on alternate Fridays during the next two months. Each speaker announced below will be interviewed on the air by Carol H. Woodward. The programs will be:

July 14 ***Garden Flowers of Mid-Summer—A Program for Children***
Helene Carter, Artist: Illustrator of "Where Did Your Garden Grow?", "First the Flower, Then the Fruit" and other books.

July 28 ***Vegetables for August Planting***
Francis Paterson, Superintendent of Panfield Corporation, Lloyd Harbor, Huntington, L. I.

Aug. 11 ***Foods and Flavors From Little Known Vegetables***
Mrs. Mortimer J. Fox, Author of "Gardening for Good Eating," "Gardening with Herbs for Flavor and Fragrance" and other books.

Aug. 25 ***Sunshine and Rain on a Corn Field***
Dr. E. E. Naylor, Assistant Curator at the New York Botanical Garden.

Notices and Reviews of Recent Books

(All publications mentioned here may be consulted in the Library of The New York Botanical Garden or may be purchased on order through the Library.)

Slime-Mold Studies—A New Book Which Marks the Culmination Of a Lifetime Hobby

THE MYCETOZOA OF NORTH AMERICA. Robert Hagelstein. 306 pages, 16 full-page plates (4 in color, 12 in half-tone), glossary, bibliography, index. Published by the author, 165 Cleveland Avenue, Mineola, N. Y. 1944. $6, postpaid.

The years which Robert Hagelstein, Honorary Curator of Myxomycetes at the Garden, has devoted to his hobby, the slime-molds, have resulted in a comprehensive book on this fascinating group of organisms. The author uses the name Mycetozoa, in preference to Myxomycetes, believing, after long studies in the field, that the group has developed from lower forms of animal life, although the reproductive, or fruiting, bodies simulate the fungi.

These fruiting bodies often appear in gardens on decaying vegetable matter such as logs, leaves, grass, or even on the bark of living trees. Their structure is often beautiful. To one who does not know them, they are curious, puzzling forms of life. Their earlier stage consists of a strange, living, feeding, moving slime, often existing for months prior to fructification.

During the 15 years that the author has been connected with the New York Botanical Garden, the collection of fruiting bodies in the herbarium has increased from about 2,000 to more than 13,300 specimens. The book is based on these specimens, which represent 95 percent of the world's known species. Of the 285 North American species accepted as valid, 216 were personally collected in the field by the author in his eastern travels, from upper Quebec to Florida, and in several islands of the West Indies. More than 150 species are known to occur on Long Island and other nearby territory within 25 miles of the Garden.

The book contains, besides the plates and glossary mentioned above, an introduction to the life history of the group; complete descriptions of species in 47 genera, with keys, type localities, habitats, distribution, references to colored figures in print, and extensive notes; an index to genera, species, and synonyms; and a list of more than 300 books and papers cited or consulted, with the full names of the authors and the dates of their lives. This last was prepared with the co-operation of the New York Botanical Garden's library staff. Dr. John Hendley Barnhart, Bibliographer Emeritus, also aided publication of the work by editing and proof-reading the entire volume.

A descriptive circular which has been prepared shows sample pages from the book, which was published in May.

Fog and Other Things

KNOWING THE WEATHER. T. Morris Longstreth. 150 pages, illustrated, indexed. Macmillan, New York, 1943. $1.69.

"Knowing the Weather" is one of many recent books aiming to interpret the weather for an educated layman. For the most part, it fails in this purpose. The reader may be confronted with terms before these terms are defined or explained. Important concepts are more confused than clarified by the author's continuous and elaborate use of metaphors. No diagrams aid the reader. Extensive running descriptions of weather changes resulting from modifications of moving air are given without the necessary explanations of why these changes occur. More successful are the chapters devoted to relatively isolated topics such as snow or fog. The author's unbounded enthusiasm for his subject helps to mitigate the pedagogical and technical errors.

BARBARA MCCLINTOCK,
Carnegie Institution of Washington,
Cold Spring Harbor, N. Y.

History and Future of Private Enterprise in Lumbering

THIS FASCINATING LUMBER BUSINESS. Stanley F. Horn. 328 pages, illustrated, indexed. The Bobbs-Merrill Co., Indianapolis, 1943. $3.75.

Mr. Horn has stated a case for the lumbermen that can not be refuted, and he has not only covered the subject in a broad manner, but has specifically defined the industry by regions and by its various component parts. One of the most unusual features of "This Fascinating Lumber Business" is that Mr. Horn has traced its history right from the very beginning of the lumber business up to the present moment when the industry is playing such an extremely important part in the war effort, and has even extended the industry's ideas and plans beyond the war period into the developments anticipated for the future.

Throughout the book he has ably stated the case for private enterprise and against governmental domination of the forest as a crop. Certainly, no one denies that there was waste during the early years of development of our country and of the industry, but Mr. Horn has pointed out that the public interest in the forest resources is being capably managed today by the industry that has often been referred to as the "awakening giant."

The book is easy for the layman to read because of the manner in which he has carried on the historical romance of a natural resource industry, and yet it is interesting to lumbermen and technicians too, for the basic information and data which he has included.

R. E. BRODERICK,
Executive Secretary
Northeastern Lumber Manufacturers Association, Inc.

Midwestern Background

DUNE BOY. Edwin Way Teale. 255 pages, illustrated by Edward Shenton. Dodd, Mead & Co., New York. 1943. $3.

Mr. Teale tells of his childhood vacations with his grandparents on an Indiana farm, of his first efforts to make money, to make a flying-machine, to write books, to be a naturalist. But, more than that, he recreates for us, in simple and charming prose, the characteristic background of so much of America's healthiest growth. It is all there—hoop-snakes, visits to town, chores, and a wonderful collection of neighbors. In the midst of the scene move Gramp and Gram, and the author merits our thanks for making us acquainted with them if for nothing else. Anyone who grew up on a midwestern farm will enjoy this book—also anyone who wants to know why midwestern farmers are that way.

H. W. RICKETT.

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To reach the Botanical Garden, take the Independent Subway to Bedford Park Blvd. station; use the Bedford Park Blvd. exit and walk east. Or take the Third Avenue Elevated to the Bronx Park or the 200th St. station, or the New York Central to the Botanical Garden station.

Membership in

THE NEW YORK BOTANICAL GARDEN

and what it means

TO THE INSTITUTION, membership means support of a program that reaches several hundreds of thousands of persons annually.

Briefly, this program comprises (1) horticultural display, (2) education, (3) scientific research, and (4) botanical exploration. To further this work and to disseminate useful information about plant life to the public, the Garden issues books and periodicals, both scientific and popular, and presents lectures, programs, radio broadcasts, and courses of study in gardening and botany. The laboratories and large herbarium and library serve the staff in its research and educational work, while the extensive plantings at the Garden give the public vistas of beauty to enjoy the year around. The public is also free to use the Botanical Garden's library, and, under direction, to consult the herbarium.

TO THE INDIVIDUAL, membership means, beyond the personal gratification of aiding such a program, these privileges:

Free enrollment in courses up to the amount of the annual membership fee paid.

A subscription to the Journal and to Addisonia.

Admission to Members' Day programs and use of the Members' Room also at other times.

A share of plants when made available for distribution. (These plants may include the Garden's new introductions into horticulture.)

Personal conferences with staff members, upon request, on problems related to botany and horticulture.

Free announcements of special displays, lectures, broadcasts, programs, and other events.

Use of lantern slides from the Garden's large collection, under established regulations for such loans.

A membership card which serves as identification at special functions at the Botanical Garden and also when visiting similar institutions in other cities.

* * * *

Garden clubs may become Affiliate Members of the New York Botanical Garden, and thus receive certain privileges for the club as a unit and others for individual members. Information on Garden Club Affiliation will be sent upon request.

* * * *

Classes of membership in the New York Botanical Garden are:

	Annual Fee		*Single Contribution*
Annual Member	$ 10	Member for Life	$ 250
Sustaining Member	25	Fellow for Life	1,000
Garden Club Affiliation	25	Patron	5,000
Fellowship Member	100	Benefactor	25,000

Contributions to the Garden may be deducted from taxable incomes.

Contributions to the Garden are deductible in computing Federal and New York estate taxes.

A legally approved form of bequest is as follows:

I hereby bequeath to The New York Botanical Garden, incorporated under the Laws of New York, Chapter 285 *of* 1891, *the sum of*_____.

Gifts may be made subject to a reservation of income from the gift property for the benefit of the donor or any designated beneficiary during his or her lifetime.

All requests for further information should be addressed to The New York Botanical Garden, Bronx Park, New York 58, *N. Y.*

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

TODAY'S NEW GARDENERS

MANY VICTORY GARDENERS in the United States are now in their third year of production, and, judging from the remarks one hears when gardeners get together, this will be their most successful year of all. They have taken their problems seriously and have learned their lessons well. Many are now developing flower gardens too.

After the war began, the New York Botanical Garden was the first of all organizations to inaugurate instruction in vegetable gardening for city dwellers. Since then many other groups have followed suit. The Garden offered lectures and practice in evening and daytime classes, gave courses in conjunction with the New York Times, and presented radio programs to help beginning gardeners; and from the start of the Victory Gardening movement, the public has freely used its privilege of gratis consultation with staff members –in person, by telephone, and by correspondence.

Fewer people are attending classes now. They have learned their fundamentals and now consider themselves experienced gardeners, able to carry on with only occasional help from the old-timers and professionals.

When the war is over, will they cease to grow their own vegetables and flowers, or will they continue gardening? For the majority, it appears, the dictum will be, "Once a gardener, always a gardener." The enthusiasm that has been engendered by the joy of working with the soil and harvesting its abundance in vegetables and flowers will not be discouraged easily when tension is eased. For no head of lettuce from the Broadway market will have the flavor of those crisp, curled leaves that were watched from the time they were seedlings and served fresh from the garden. No carrots or cabbage from the store will bring the kind of inner satisfaction that comes from eating the vegetables one has toiled over since spring. And no florist's flower brings the pleasure of a bouquet from one's own yard. These are irreplaceable sensations.

The Victory Gardening movement has made gardeners unexpectedly out of a large proportion of the population. Some, of course, are merely performing a duty for the duration of the war, but many are going to enjoy being gardeners—and good gardeners –for the rest of their lives. It is a promising outlook. The fact that gardening has become an important new part of life for many people augurs well for our civilization.

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Rose Enthusiasts From Many States Attend Second Annual Program at Garden

EASTERN states as far south as Virginia were represented among the 160 or more persons who attended the second annual Rose-Growers' Day at the New York Botanical Garden June 13. The second district of the American Rose Society co-operated in arranging the event.

The Garden's collection of 7,000 roses of more than 800 kinds (of which nearly 80 are natural species and varieties) had reached the peak of its bloom only a few days before, and it formed an attractive background for the meeting, which took place beneath the trees across the road from the Rose Garden. For several hours before the speaking program was scheduled to begin, visitors were wandering among the roses, studying and photographing them. By 10:30 when Mr. L. C. Bobbink, donor of most of the roses in the great garden, was to have led a tour of the planting, more than a hundred visitors had assembled. Mr. Bobbink, however, was prevented by slight illness from attending. He was represented by his daughter, Mrs. George C. White, and by Messrs. Robert W. Eisenbrown, L. A. Howard, and Peter Kooy of the firm of Bobbink & Atkins.

Dr. William J. Robbins opened the speaking program at 11:30 and introduced Paul F. Frese, second district chairman for the American Rose Society, who presided during the morning session.

The first speaker was Everett A. Piester, Assistant Superintendent of Parks in Hartford, Conn., and director of Hartford's rose garden in Elizabeth Park, who talked on "The Newer Varieties of Roses: Their History and Promise." He was followed by Dr. L. M. Massey, Professor of Plant Pathology and head of the department at Cornell University, on "Control of Rose Diseases under Wartime Conditions." Both addresses are being published in this Journal this month.

A long noon hour, accompanied by picnic lunches under the trees, served as the occasion for the professional and amateur rose growers present from

many states to meet each other and to discuss their favorite topic informally. Among those who attended, approximately 18% each came from the State of New Jersey, Westchester County, and New York City, 13% each from Pennsylvania and Long Island; 8% each from the rest of New York State and from Connecticut; and the remainder from other states, including three enthusiasts who came up from Portsmouth, Va., to be present for the day.

Questions Discussed at the Round-Table

Dr. R. C. Allen, Secretary of the American Rose Society, led the round-table discussion after lunch. To answer the first question, on how to select a good rose plant, he called on Mr. Piester, who said:

"Buy with caution, especially if you are buying packaged roses; buy with both eyes open. See that the plant inside is green, not dried and brown. It should have a good system of fibrous roots, with not too much cut off. It should consist of two or three good canes—green ones. It is important to know *where* your roses are coming from. The quality of the rose will depend largely upon the reliability of the grower."

Dormant or Potted Roses?

Asked whether dormant or potted roses were to be preferred, Dr. Allen called upon S. B. Hutton of Conard-Pyle Company, who said that he would recommend dormant roses for fall or early spring planting, and potted plants for setting out in late spring. He advised loosening of the roots of potted roses, disturbing the soil as little as possible. Puddling of the soil around the roots he recommended only for the planting of dormant stock.

"When planting in autumn," he said, "hill up the soil 6 to 8 inches around the stems of the plants and leave it there until growth starts—which will probably be in April. Also when planting in spring, hill up the soil the same way around the stems of the dormant roses and leave it for 10 to 14 days, or until growth begins."

Mr. Hutton suggested autumn as the best planting time for roses in northern United States; but, he warned, it must be done after frost has stopped all possibility of further top growth.

The Age of Rose Plants

When a member of the Little Gardens Club in Greenwich Village, an Affiliate of the New York Botanical Garden, asked to what age a rose might live without care, Mrs. Frederic L. Keays, who has brought many long-lost old-fashioned roses back into cultivation, said that she knew that some of the roses she had found in abandoned settlements were more than a hundred years old. Applause greeted the story then told by the Little Gardens Club member of how she had brought back to vigorous growth and beauty some long-neglected roses which were covering unknown graves in an ancient cemetery.

How Deep to Dig

Depth of soil preparation for roses elicited much discussion. Dr. Cynthia Westcott of Glen Ridge, N. J., said that she "always followed the rules" and prepared her ground two feet deep when planting roses.* P. J. McKenna of New York expressed himself in favor of 12 to 14 inches of preparation, as long as plenty of good organic matter and fertilizer were added to the soil.

George H. Gillies of Huntington, Long Island, said: "One foot deep is enough only when you know what is underneath. If you don't know, dig deeper and improve the soil to a depth of two feet by adding farm manure. If you can get farmyard manure, stick to it, in preference to leafmold or peatmoss." Mr. Gillies grows his roses on sandy locations, but each rose bed is deeply dug and prepared by the addition of good topsoil and farmyard manure.

Edwin Sinnock of Newark, N. J., on the other hand, has a heavy clay in his

* Discussing this matter afterward, Dr. Westcott said that two *spades* would be more accurate than two feet of depth in her own practice.

garden. He digs 12 inches deep, uses grass clippings and tobacco stems for a mulch, and, he says, he has fine roses.

The Pennsylvania State College, Dr. Allen reported, found, after extensive tests, that the deeper the soil was prepared, the more flowers were produced. However, the increased production in soil prepared 24 inches deep did not seem to compensate for the additional effort and expense when compared with the production of the plants in soil prepared 18 inches deep. He expressed himself as personally considering that 12 inches is sufficient in the ordinary garden and is a compromise between what is usually practical and what is technically ideal.

Feeding Programs in Rose Gardens

Mulches and fertilizers used by different growers also varied. Dr. Westcott said that she hilled her roses in the fall with leafmold and did not remove too much of it in spring, incorporating the rest in the soil. For those who have fresh poultry manure available, Dr. Allen recommended 15 to 20 pounds per 100 square feet to be used as a top dressing for fertilizer in the very early spring or in late fall.

Harry L. Erdman, who manages the famous garden of roses at Hershey, Pa., and who is President of the American Rose Society, was asked to describe his year's feeding program.

"We test the soil in the rose garden regularly," he said, "not in every bed but in a few selected beds, and apply our fertilizer according to the immediate needs of the plants. Our basic formula is a 4-12-4 fertilizer applied at the rate of 4 pounds to every 100 square feet of ground for a full feeding.

"We give a full feeding of a balanced fertilizer such as this early in the spring; then after the first blooming is past we give a half measure, after testing the soil again. In August a full measure is given if the soil test shows that it is needed."

Mrs. Charles Doscher of New York City and Long Island, President of the State Federation of Garden Clubs, and one of the outstanding amateur rose-growers in the East, was called on next to tell the secret of her success so far as soil treatment was concerned.

"I am a great believer in cow manure for roses," she responded. "I have used much more of it than is generally recommended. I have it applied in the fall, completely filling the hollows which are left after hilling up the roses. This is always fresh. A later application of manure that is several months old is dug into the beds in the spring. Large amounts of superphosphate are also given in the spring, and a great deal of water is used all during the growing season. Also one application of a chemical fertilizer is given each season."

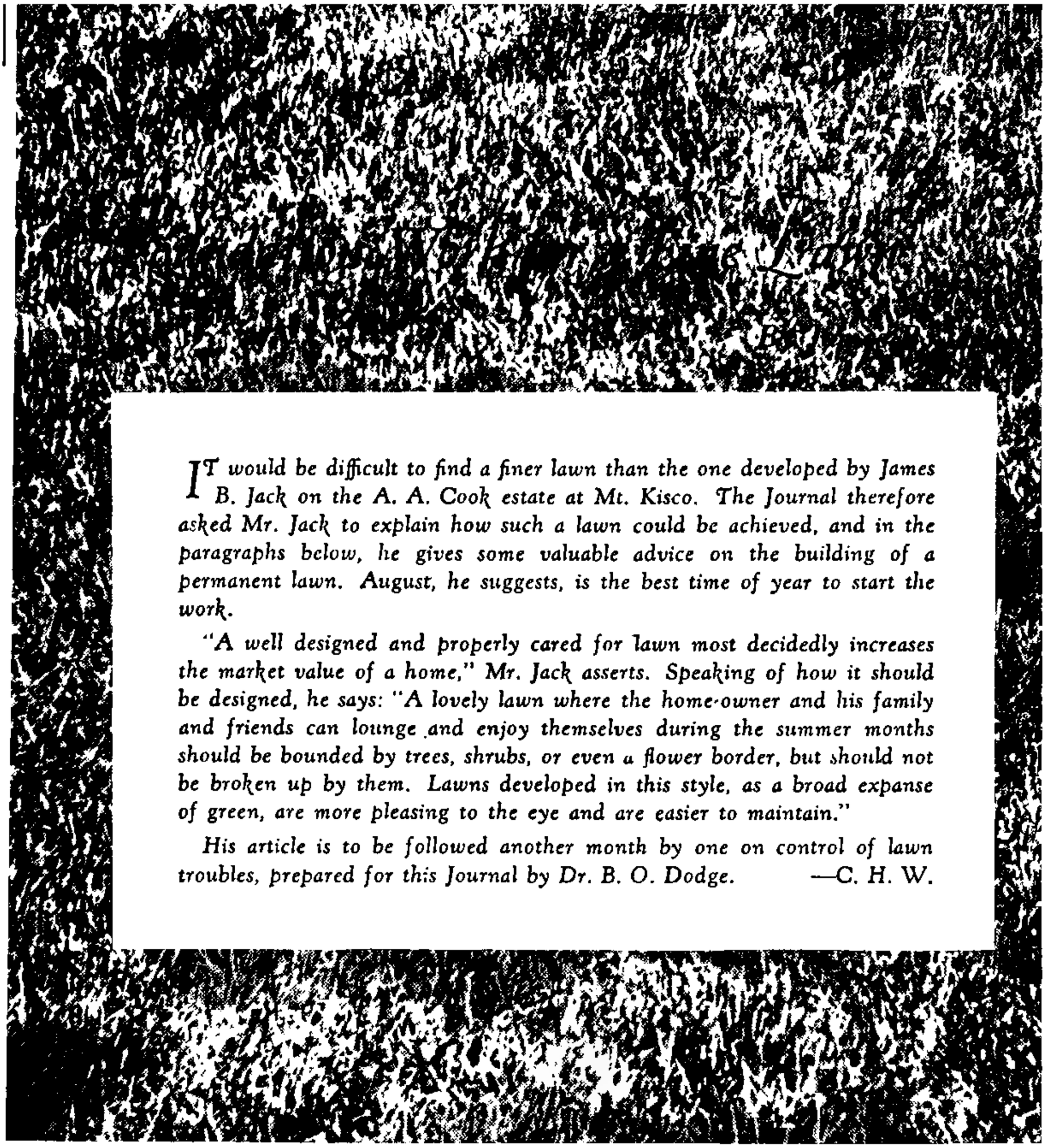
While the majority who spoke felt there was little that could be done to check the Japanese beetle once it got into the rose garden, Dr. Westcott was more hopeful, and said that to spray with a good stomach poison once a week would keep the beetles off the foliage, while the blossoms could be saved from their ravages by picking buds and letting them open in the house.

For red spider control, Mr. Erdman recommended C. P. O. soap and nicotine sulphate as a spray on the under sides of the leaves. Triogen also, he said, would be effective.

When roses are affected by crown-gall, Dr. Massey explained in response to a question, the soil immediately about the roots of a diseased plant should be removed along with the plant, or else it should be sterilized before setting a new plant, because the bacteria causing the disease can live for two years in the soil. It is therefore safe to set plants in the old soil only after two years have elapsed. Galls at the crown of a rose plant are especially injurious, he said.

"For the canker diseases, such as brown canker and stem canker," Dr. Massey continued, "the diseased parts should be removed by pruning, then burned, and the plants protected against new infections by spraying or dusting. For root knot, or gall, the soil should be treated with a nemacide, such as chloropicrin, before replanting to roses. The removal of root knots, or of the swellings in crown gall, from the infected plants does not correct these two troubles —affected plants should be burned."

Before the afternoon's discussion came to an end, Dr. Allen asked Mrs. Keays to come to the platform, and she appropriately concluded the program by paying tribute to Mr. Bobbink for the way he had appreciated, hunted, collected, grown, distributed, and loved the old-fashioned roses.



IT would be difficult to find a finer lawn than the one developed by James B. Jack on the A. A. Cook estate at Mt. Kisco. The Journal therefore asked Mr. Jack to explain how such a lawn could be achieved, and in the paragraphs below, he gives some valuable advice on the building of a permanent lawn. August, he suggests, is the best time of year to start the work.

"A well designed and properly cared for lawn most decidedly increases the market value of a home," Mr. Jack asserts. Speaking of how it should be designed, he says: "A lovely lawn where the home-owner and his family and friends can lounge and enjoy themselves during the summer months should be bounded by trees, shrubs, or even a flower border, but should not be broken up by them. Lawns developed in this style, as a broad expanse of green, are more pleasing to the eye and are easier to maintain."

His article is to be followed another month by one on control of lawn troubles, prepared for this Journal by Dr. B. O. Dodge. —C. H. W.

A LAWN is a long-time proposition, therefore a good foundation must be built to give the grass plants a happy place to live.

One of the most important items in the building of a lawn is drainage. Apart from carrying off superfluous water which may collect from time to time, it is beneficial in aerating the soil, for grass as well as any other plant must have a certain amount of air around its roots to keep it in a healthy growing condition. If the area is naturally well drained, so much

The illustration on this page, showing part of a lawn grown from Washington creeping bent grass stolons, is an enlargement of a photograph provided by the O. M. Scott & Sons Company of Marysville, Ohio.

the better; but if water stands in low spots long after a rain or if the soil is heavy and the ground inclined to remain wet, artificial drainage will be necessary.*

Thorough preparation of the soil calls for attention next. The ground must be properly graded, either on a level or on a gentle slope away from the house, and the soil must contain an ample supply of organic matter. It is a good plan to have the soil tested for its lime and food content. This can be done by the nearest State Agricultural Experiment Station, which will make an analysis and a recommendation. Heavy soils can be made more porous by incorporating sand and humus in some form such as pulverized peatmoss at the rate of 1 cubic yard to 500 square feet of surface, working it into the top 4 inches of soil. On the other hand, if the soil is light and sandy, humus alone should be worked into the top 4 inches at approximately the same rate. The soil should be forked over, however, to a greater depth than this, but if it is already good and natural drainage is satisfactory, preparation need not be more than 6 inches deep.

Natural manures, such as barnyard refuse, are not too desirable in the making of a lawn, as the weed seeds which they contain are likely to give trouble for a period of years. If the manure is so thoroughly rotted that the seeds are destroyed, the plant food value of the product then is largely lost. A well balanced commercial fertilizer of an 8-6-4 formula (8% nitrogen, 6% phosphates, and 4% potash), worked into the top 2 to 3 inches of soil will give sufficient nourishment for the new grass for some time to come. If lime is necessary, it should be applied to the surface and raked in at the rate of approximately 30 pounds of hydrated lime or 50 pounds of ground limestone to 1,000 square feet. This is better done a month or two prior to seeding, and care must be taken never to apply fertilizer and lime at the same time. There ought to be a lapse of at least ten days between them.

As long as Japanese beetles continue in this region, grub-proofing ought to be done while one is preparing the lawn's foundation. Arsenate of lead may be used and worked into the surface at the rate of 15 pounds per 1,000 square feet. This quantity should provide protection for a period of approximately ten years. On a seeded lawn, the arsenate may slow up germination for a period of 10 to 15 days, but if stolons are used instead of seed, it makes no difference.

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* To install a drainage system, trenches should be dug for lines of 4-inch drain tile to be laid 15 to 20 feet apart at a depth of 18 to 24 inches. The grade of the tile should be at least 3 inches to 100 feet, and it is sound practice to have a similar pitch on the surface grade. Adequate provision must be made for the discharge of water at the outlet of the tiles. It is well to cover the joints of the tiles with strips of strong tar paper or building paper to prevent the soil from clogging up the joints until the ground has definitely settled. One must be very careful about having an equal and even distribution of topsoil over the area after the drains have been laid and covered.

It is very important that the seed mixture be suited to the location and climate, as well as to the soil and conditions of sun or shade. A good mixture and plenty of it are essential. All seed houses of good repute carry combinations for special purposes, and it is probably better for the amateur to use them than to try to mix his own.

Good clean seed is never cheap, but the use of the highest quality mixture for a given purpose is a good investment. The following varieties are suitable for various locations:

A. Kentucky bluegrass is recommended for a neutral loam in a sunny area.

B. Fescues are particularly useful for dry, rather shady locations where soil is neutral or slightly acid.

C. Poa trivialis is good for a heavy soil in a moist and shady location.

Seeding should be done at the rate of 7 to 9 pounds per 1,000 square feet. Redtop is very useful as a nurse crop, as it comes up quickly, offering protection to the more permanent grasses in their early stages of development and helping to smother out quick-starting weeds. This can be mixed with any of the aforementioned varieties at the rate of 1½ pounds to every 7 to 9 pounds.

Before seeding, it is essential to loosen the soil surface with an iron rake to a depth of 1 inch. A good plan is to divide the quantity of seed into two equal parts, one half to be used when the sower goes back and forth from north to south, the remaining half as he walks back and forth in an easterly and westerly direction; this tends to provide for an even distribution of the seed. A perfectly calm day should be chosen for seeding, when the sky is cloudy, if possible, in order to retain surface moisture. As soon as the seed is sown, the surface can be raked lightly with a fine-toothed rake, then rolled lightly to firm the soil around the seeds to insure quick germination.

For a really beautiful lawn, however, regardless of cost, I would recommend the bent grasses (certain species and varieties of *Agrostis*)—especially the one known as "Washington Creeping Bent." This grass entails much more care and attention, but a perfect lawn can be obtained within six months if one purchases stolons instead of seed. These so-called "rootstocks" are cut up and broadcast like seed, covered lightly with a quarter-inch of soil, then rolled. The ground must be kept moist constantly until the stolons start to grow. A perfect bent lawn may also be procured by sowing seed as already described, but it takes longer for the young grass to come up thickly enough to prevent the growth of weeds—and weeds must never be allowed to get a permanent hold or to go to seed. If stolons are to be used, the best time to plant is in late August or early September. They can then be mowed twice before frost sets in.

The best time to sow seed is in the fall, when there is less competition

offered by weeds and when there is the added advantage of cool weather and fall rains. A spring sown lawn runs the unfortunate chance of burning out during the hot summer months. If, however, one has to seed in the spring, it is entirely possible to do so successfully.

If seeding has been delayed in spring, it is practical to cover over the newly seeded ground with brush, straw, or burlap and moisten it frequently to prevent drying or baking, but this covering must be removed as soon as the young grass appears.

Watering a newly made lawn must be done very gently at first, with a fine sprinkler to prevent washing. It must be done often enough to prevent the soil from drying out. After the grass is well started, a lawn can be watered more thoroughly each time but not quite so often as before. Deep and thorough watering assures the development of deep-rooting grass, upon which much of the future success of the lawn depends. Sprinkling or insufficient watering has a tendency to bring the roots too near the surface, where they are liable to suffer from the burning effects of the sun.

When commencing to mow a new lawn, set the blades of the lawn mower to cut about 2 inches high above the ground. Later, as the grass thickens into a real sod, the blades of the mower can be adjusted to cut closer. If the lawn is mowed frequently so that the crop of cut grass does not lie on the surface in mats or lumps, the clippings may be left on to act as a mulch feed. If, on the other hand, the clippings are too heavy, it is advisable to use a catcher on the mower. The cut grass can then be placed in a compost heap for garden manure.

A lawn that has become well established should be raked over in early spring with a steel rake, removing all refuse gathered during the winter. Then should follow the top-dressing, composed of screened humus and 8-6-4 fertilizer (described above), applied at the rate of 1½ cubic yards of humus compost and 8 to 10 pounds of fertilizer to 1,000 square feet of lawn surface. This dressing must be spread on very evenly after it has been well mixed, to prevent a spotted dark green and light green appearance later on.

During the summer months, it is essential to water frequently during dry spells. Mow as often as necessary, and be sure that weeds are prevented from seeding. Don't fertilize the lawn during very hot weather, as it might cause burning. If it is necessary to feed during hot weather, use half the quantity referred to for spring and be sure to water it in thoroughly immediately after spreading it on the lawn.

It is especially necessary to feed your lawn in the fall. This should be done by the end of September, and the 8-6-4 mixture again should be procured. Prepare finely sifted soil and humus sufficient to cover the lawn to a depth of a quarter of an inch, add the fertilizer at the rate of 12 to 15 pounds to a bushel of the soil and humus combination, mix well and spread.

evenly over the lawn surface, afterwards taking the back of a rake to work it into the grass. Proceed in this manner until the entire lawn has been so treated; then water in thoroughly.

When the leaves start to fall, don't allow them to lie on the grass for any length of time, as they are inclined to suffocate it. Snow is the best kind of winter covering for a lawn.

The History and Prospects of New Roses

By Everett A. Piester
Elizabeth Park, Hartford, Conn.

WE are fortunate in having a great many roses sent to Elizabeth Park for preview before they are named or catalogued, although of course we do not get half of the new introductions. My comments must, therefore, be based on limited observations of a limited number of varieties, and chiefly those in our test garden. Whenever I look through any selected lists of roses or through any collection of comments such as the American Rose Society's "Proof of the Pudding," I am conscious of a constant personal bias or prejudice for or against a rose which may be due to the human element or to circumstances pertaining to the plant or to its environment and care. Therefore I do not expect every one to accede wholly to my views.

I am happy to have been one of those applauding when the following recent rose introductions came into prominence leading to at least temporary popularity: ***Crimson Glory, Gloaming, Reveil Dijonnais, Shenandoah, Countess Vandal, Mme. Cochet-Cochet, Dickson's Red, Carillon, Eclipse, McGredy's Yellow, Scorcher, Will Rogers.*** They were especially notable although one or two are now out of the catalogs.

During this same period I unfortunately favored some that looked good in the early reaches of the race for enduring popularity but have finished in the longer list of "also-rans." I still have visions of the sensational beauty of the hybrid rugosa pillar ***Sanguinaire.*** ***Smiles*** promised to be a good double-flowered floribunda. ***Serene*** looked like a good near-white. The blended pink, ***Dr. Kirk***, I greatly desired to be worthy of its namesake, the recent president of the American Rose Society, who has been not only a great rose enthusiast but an inspiring leader.

The one new rose to which I most wish success and long life is ***Mme. Chiang Kai-Shek.*** Like the gracious lady for whom it is named, this rose has an air of elegance, and it is stately if not robust. It may not be a "rose for the ages" like ***La France*** or ***Radiance,*** for the plants are rather erect in habit and are not well branched; therefore, it does not have a great quantity of blooms. It is a rose for the specialist and for exhibition,—a rose aristocrat. From its mother, ***Joanna Hill,*** comes the texture of its blooms, its long stems and well balanced if not disease-free foliage. From *Sir* ***Henry Seagrave*** it derives delicacy of petalage, lemon tint and long pointed buds. Usually the flowers are very large, beautifully tinted, well stemmed, but not too abundant. Personally, I class ***Mme.***

Chiang Kai-Shek along with ***Poinsettia, Eternal Youth, Sterling, Gloaming, McGredy's Yellow*** and ***Rex Anderson.*** They are all too elegant to bloom in profusion and too fine for the average backyard rose bed.

The much advertised ***Pinocchio*** has not done very much with us, and I have not become enthusiastic over its reputedly profuse flowering plants and its small cushion-type flowers; I cannot praise or condemn it.

McGredy's Triumph is hardly new and never will be largely planted. It is a very coarse-foliaged variety with wide or rangy habit of growth, does not branch freely enough, and is too gross for the average garden, but it can and does produce about the largest and most entrancing blooms of any hybrid tea variety we have. Its fragrant blooms have carmine-rose as the basic color with an undertone of shaded orange at the base. It was the first to have its kodachrome portrait taken last fall for my Rose Gallery of Garden Glamor.

Others in this Rose Gallery were ***Girona,*** which is a large-flowered variety with striking Turkey-red and gold colors accented by large, glossy, dark green foliage. It also has a peculiar apple fragrance. ***Better Times*** is too well-known for its well-formed cerise blooms to need further description. ***Mrs. Katherine T. Marshall*** appears to be an adequate rose to honor the wife of the Chief of Staff of the United States Army, General George C. Marshall. This is one of the prima donna roses being introduced by Jackson & Perkins. It was originated by Eugene S. Boerner, who used Montgomery's great rose ***Chieftain*** as one of its parents and an unnamed seedling for the other. For the last rose in this series I chose ***Mary Margaret McBride,*** which was one of the last roses hybridized by late Dr. J. H. Nicolas, who gave us such fine roses as ***Eclipse, Carillon, Gloaming*** and ***Smiles.*** All of the roses just mentioned are particularly good in the autumn and last year they flowered for us at the height of 5½ feet. This was all one season's growth because we cut back all hybrid teas to about six inches every spring.

Grande Duchesse Charlotte is a very lovely carmine shade to copper-yellow. It makes vigorous, well-branched plants and has a trace of fragrance. It is not particularly good in hot weather, unless buds are picked, for they lose their delicate coloring in bright sunlight.

Fred Edmunds was named for the curator of the famous Portland Rose Garden in Oregon. It has done well in the western states and is favored by many eastern growers for its gorgeous burnt-orange-apricot coloring. The plants were rather ordinary with us and we did not think it had quite enough flowers.

Pearl Harbor and ***Douglas MacArthur*** are roses introduced by Howard & Smith of California. They have rated fairly high in many test gardens, but personally, I do not regard them as great roses. I think their popularity may not exceed the familiarity of those terms during the present war period. ***Douglas MacArthur*** came from two very fine red roses, ***Mrs. J. D. Eisele*** and ***William Breeder;*** both of them, however, have long since disappeared from the catalog.

The rose ***Lowell Thomas*** which is being introduced by Conard & Pyle is one of the most attractive of the new roses. I think most gardeners will like it if they get good plants. Its color is lively lemon to chrome yellow. Plants are of moderate size with nice foliage and moderate blooming during the season.

Charlotte Armstrong is one of the roses that you like or not according to personal taste. It is not fragrant, it is spectrum red with a tendency to carmine on the reverse. Buds are long and open slowly. The plants are vigorous, well branched and very prolific. I regard it as a great rose for bedding and cutting.

Heart's Desire is reputed to be finicky and to have weak necks. Mr. Swim of Howard & Smith sent 30 plants on at my request but protested that they were No. 2 size and on Manetti understock. They have survived three winters and are most satisfactory. The color is rich deep red and the perfume superb.

Narzisse is one of Mr. Pyle's introductions. The general color is pale yellow fading nearly white. Its petals roll back at the edge as it unfolds. In hot weather it lacks substance and the edges burn or shrivel rather sooner than one would wish.

Good News introduced from Meilland in France is a many-petaled shell pink with a copper center. It has good fragrance, good plant growth, and a fair

quantity of bloom. It may supersede ***Countess Vandal.***

Mrs. Paul R. Bosley is a deep yellow sport of the popular shaded copper bronze ***Mme. Jos. Perraud.*** Raised and introduced by Mr. Bosley of Mentor, Ohio, it is not likely to have the publicity it deserves and would receive from the large rose firms.

Cynthia Brooke is a tawny yellow with rounded buds and cupped blooms. It is not a significant rose.

Mandalay, introduced for Mallerin by Jackson & Perkins, was bred from two great roses, ***Soeur Thérèse*** and ***Feu Jos. Looymans*** and apparently exceeds either. At present I am willing to call it the finest yellow garden rose so far produced. It has a durable yellow color, pointed buds, large well petaled blooms, strong, well branched plants and good foliage.

Torch is one of the new rambler type roses. I urged its introduction because of its vigor, profuse bloom, hardiness and unusual scarlet-orange color similar to the polyanthus called ***Golden Salmon.***

Dr. J. H. Nicolas is a pillar type rose rarely growing over 6 feet. It is slow to establish but recurrent to continuous in flowering with large hybrid tea type of pink blooms.

Lily Pons is the latest of Mr. Brownell's introductions that I have and I do not find it notable.

Dinah Shore, a cerise sport of ***Jewel,*** is one of the annual grist of slight color variations of ***Better Times, Token,*** and a few other greenhouse roses sent out by Mr. Grillo of Milldale, Conn. He is an excellent florist but do not expect garden roses from there until he starts some true breeding.

Mr. M. R. Jacobus has deviated from his hobby of breeding modern centifolia roses and blended ***Crimson Glory*** and ***Ami Quinard*** in a large-flowered, long-budded, brilliant red, fragrant rose that is being sent out by Bobbink & Atkins with a great deal of promise under the name of ***Fire Chief.***

We have had ***Navigator*** as V251 since 1934. It is greatly admired for its 2½-inch cupped blooms over a long season in June. It is characterized by excellent foliage, rambler type of growth, ***Radiance*** color and resistance to disease. Mr. George Verhalen of Texas raised it from *R. Soulieana* x ***Radiance.***

Chevy Chase was originated by Neils Hansen, or perhaps, more properly by Dr. Whitman Cross of Chevy Chase, Md. It is another *R. Soulieana* derivative, a new strain of rose blood in modern climbing roses. This is a disease-free rambler with rather small dark bluish green foliage. Long canes have lingering masses of crimson flowers in clusters on rather short laterals. Its relation to *Soulieana* is evidenced by the moderate-sized leaflets of rounded or oval outline.

According to the eminent rose authority Miss Ellen Willmott, *Rosa Soulicana* was discovered in Sze-Chuan in southwest China by Père Soulié. It is a fairly hardy large straggling bush. It is most closely related botanically to the musk rose (*R. moschata*). However, its leaflets are oval and more rounded at the tip and base than the musk rose. It has small white flowers in profusion borne in fair-sized sprays or corymbs followed by brilliant orange hips.

It is worthy of note that there are now a number of capable American hybridizers who are sending us new strains or types of roses which are likely to come nearer to meeting the specifications for American garden roses than most of those that have come to us from Europe.

I have not seen flowers of ***Dream Girl.*** It is a new pillar type climber which Mr. Bobbink unveiled this spring. It is reputed to be a recurrent blooming, single- to cluster-flowered, many-petaled, fragrant, coral-pink to apricot in color. Mr. Bobbink sends it into commerce, Mr. M. R. Jacobus of New Jersey produced it, Richardson Wright admired it, and the late R. Marion Hatton named it—surely it must be a dream rose.

Control of Rose Diseases Under Wartime Conditions

By L. M. Massey
Cornell University

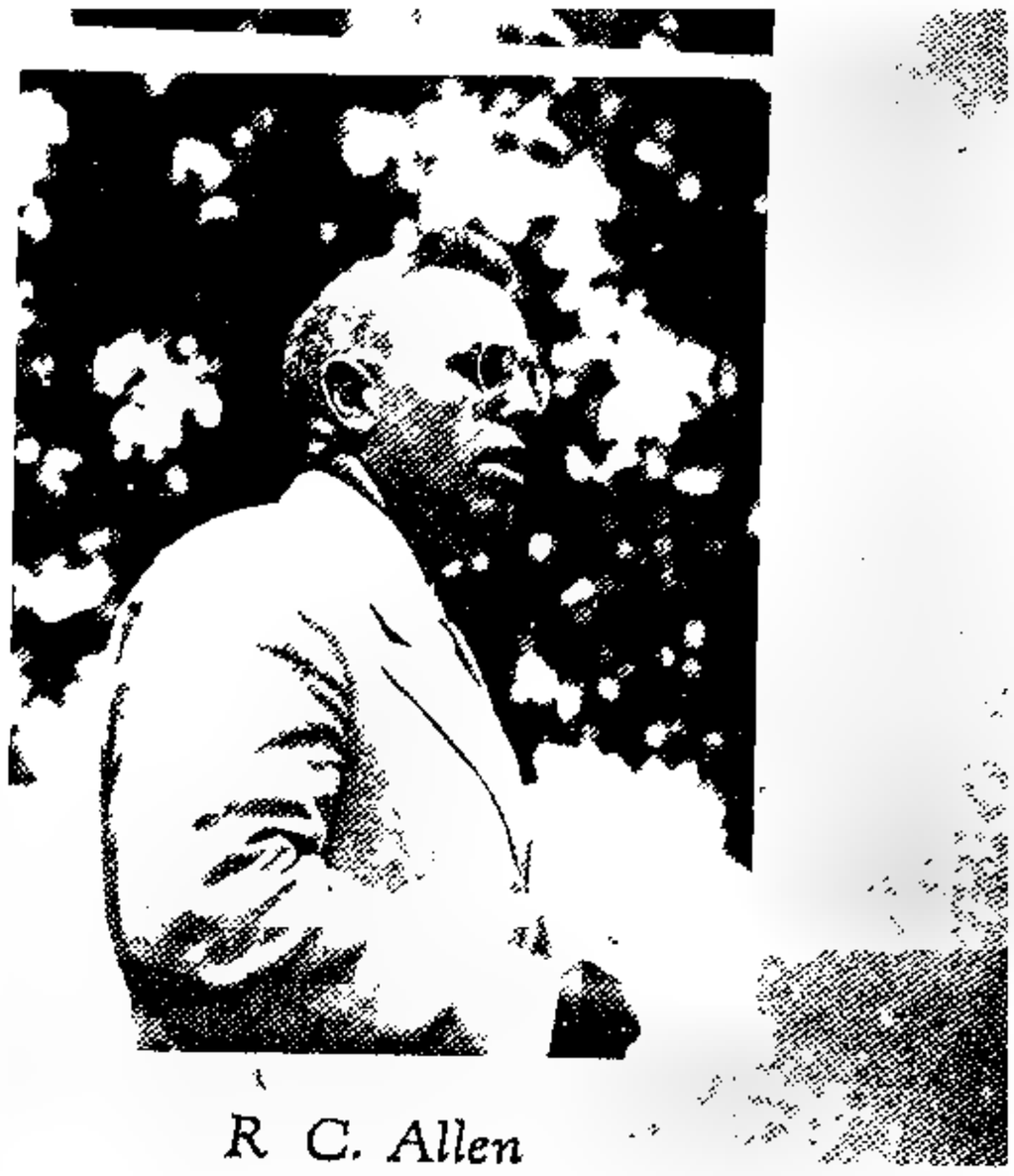
SINCE rose growers depend largely on sulfur- and copper-containing materials for disease control, and since these chemicals continue to be generally available, wartime shortages have not seriously affected our usual spray and dust practices with respect to black-spot and mildew control. Certain insecticides such as rotenone and pyrethrum are scarce and generally unavailable; but nicotine for the sucking insects and arsenate of lead (or of calcium) for chewing insects can be had, and with these we can get along very nicely until the war is over. Distribution of all materials, and especially in small packages, is none too satisfactory; but by anticipating our needs so that we can order early and shop around if necessary, we can usually get what is needed—either our preferred material or a satisfactory substitute. In some instances the pooling of interests may make it feasible to accept delivery of materials in larger lots.

With respect to disease control, timing continues to be of first importance—improper timing being the cause of more failures than the use of ineffective materials. Control of a disease such as black-spot is a matter of protection or prevention—not of cure after infection takes place; and even though mildew may be eradicated after it starts, protection is better than eradication. Thus, spray and dust practices should begin *before* black-spot starts in the garden; *before* the mildew gets well established and the leaves and flowers are damaged; and *before* the aphid population becomes large and the leaves and the growing tips are curled or otherwise damaged by their feeding.

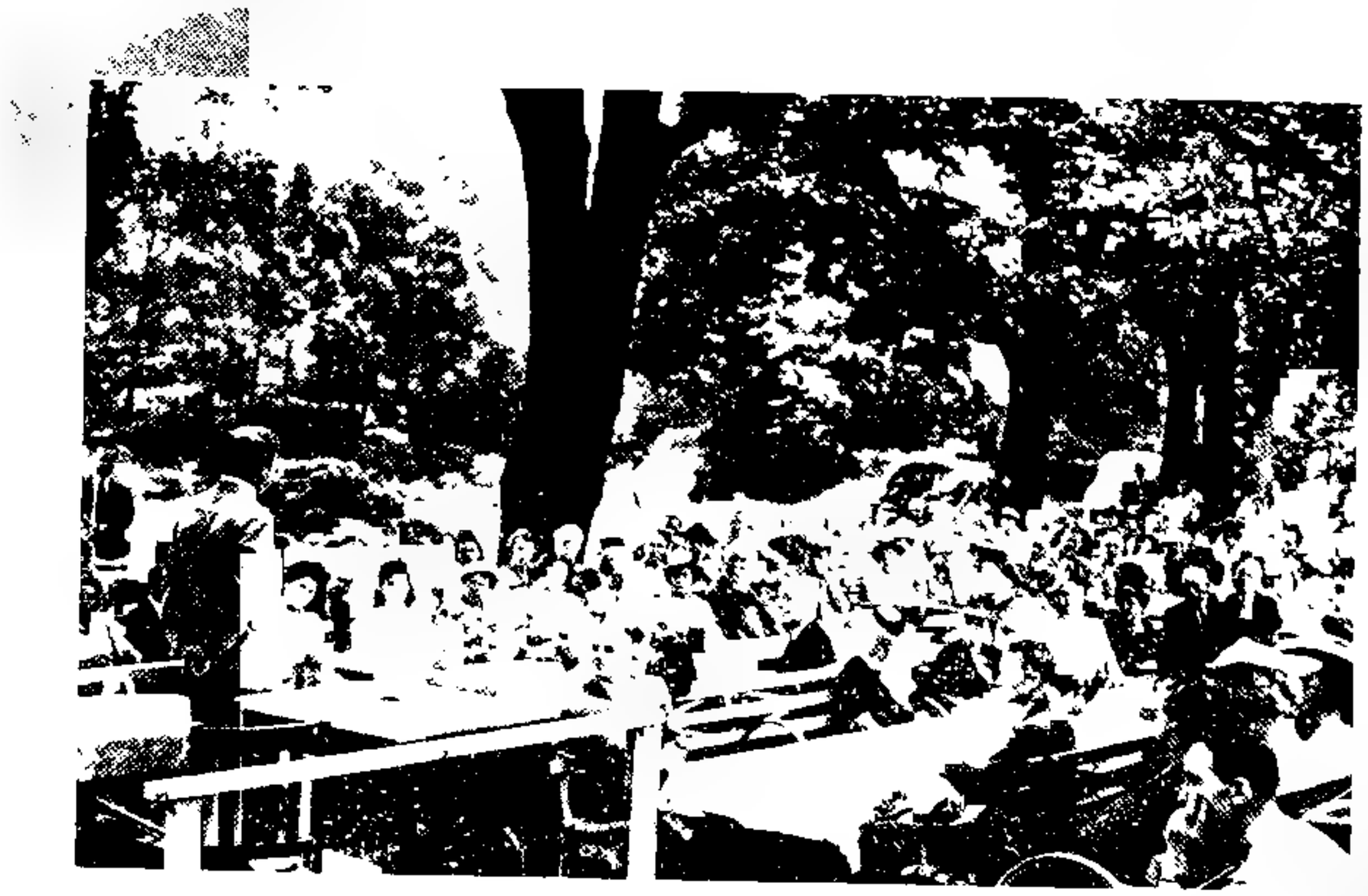
Another "before" practice that has always been looked upon with suspicion by the gardener is that of spraying or dusting *before* rains. Why put it on and have the rain wash it off! The doubt is a sound one for insect control where you want a deposit present for the insect to eat, or to contact. But for protection against black-spot and similar diseases it is sound practice to spray or dust just ahead of the rain. It is during the time that the leaf is wet that the spores germinate and penetrate into the leaf. For black-spot the story is told in six or seven hours; whenever the leaf continues to be wet for six hours or longer infection will result from viable spores present on the leaves, unless some fungicide is present to prevent infection. The spores are also disseminated by dripping, splashing and wind-borne rain.

Here in New York State and in areas with similar climate, protection against black-spot is an annual necessity if we are to keep the leaves on the

Everett A. Piester
Speaking on the newer rose varieties



R C. Allen
Conducting the afternoon's round-table



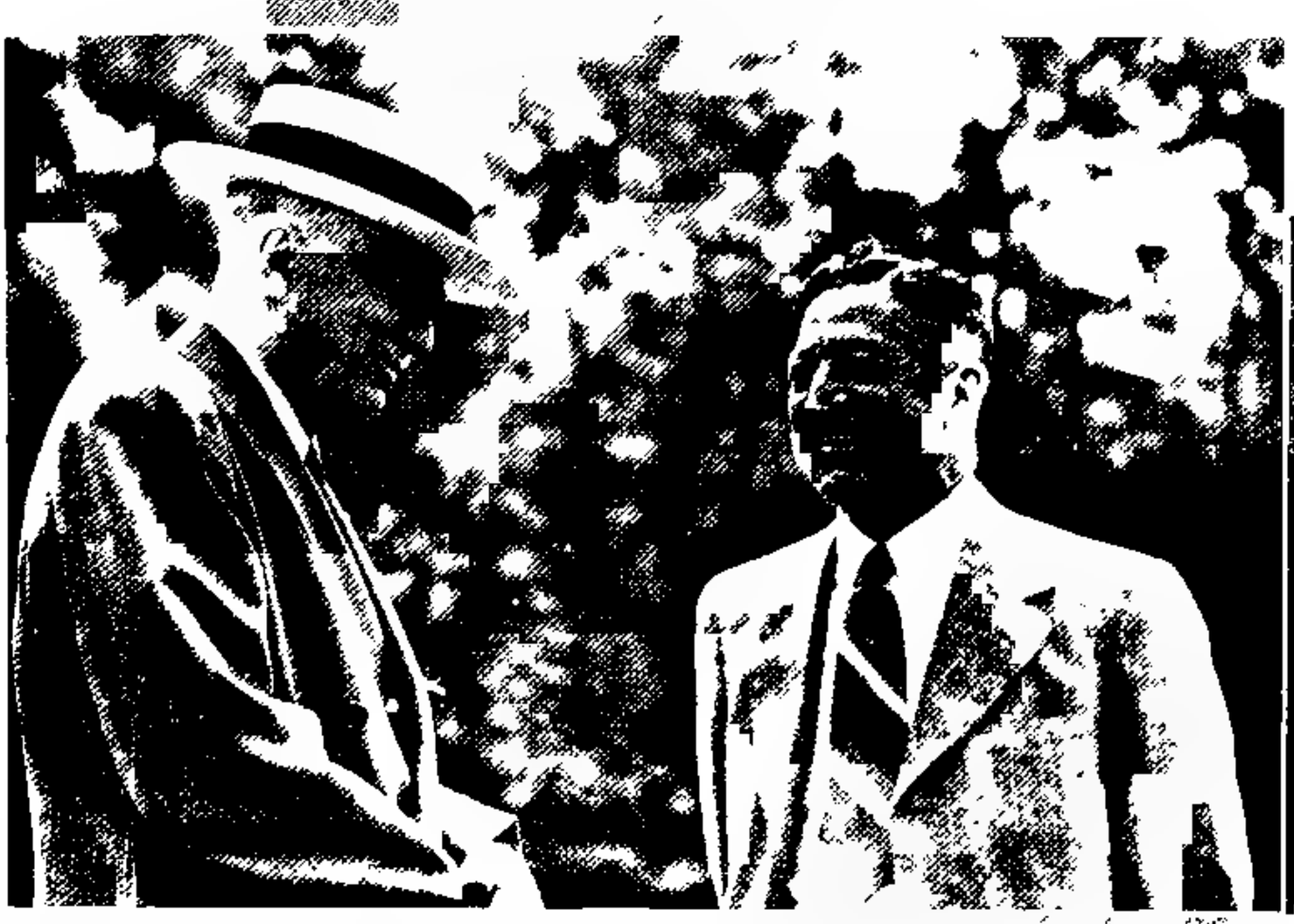
Some of the crowd of 160 or more who listened to the talks and discussions on the culture of roses.

Roses surrounding the rock which bears the plaque dedicated to L. C. Bobbink, five years after planting.

Photographs by Elmer N. Mitchi

Photographs by El...

PEOPLE, PERSONALITIES, AND PLANTINGS SEEN DURING ROSE-GROWERS' DAY AT THE NEW YORK BOTANICAL GARDEN JUNE 13, 1944



B. O. Dodge and L. M. Massey
Two plant pathologists who have both spent many years working on roses

William J. Robbins
Director of the New York Botanical Garden

The rose garden of more than 7,000 plants in 800 species and varieties.

roses thus to get normal growth and maturity of the wood, not to mention the question of sightliness. Beginning with the opening of the first leaf buds our plants must be sprayed or dusted often enough to keep the foliage covered with a good fungicide. In a normal season we average one treatment per week. In the early season when there are frequent rains and the plants are growing rapidly it may be necessary to apply a fungicide as often as twice a week to replace material dissipated by the rain and to keep the new growth covered. Later in the season we may be able to go a week, or two, or even three, without treatment. It all depends on the frequency of rains (having in mind that water from the hose has the same effect as rain water); a dry leaf will not be attacked by the black-spot fungus.

The schedule for black-spot control will usually hold mildew in check. Sprays are more effective against both mildew and black-spot if there is added to them a wetter and sticker which facilitates the wetting of the waxy surface of the rose leaf and increases the adherence of the chemical. Most of the proprietary sprays have such material in them. Otherwise good wetters and stickers are available separately.

Materials for Disease-Prevention

A word about materials. Sulfur as dust or spray is effective against rose diseases and is perhaps the substance most generally used. For a spray, a wettable sulfur is preferred; for dust, the material must be especially prepared and must be of at least 325-mesh fineness. To the sulfur, either spray or dust, may be added nicotine for sucking insects and arsenate of lead or other insecticides for chewing insects. Sulfur in any form, spray or dust, will burn when the temperatures get into the 90's and higher. Some find that they can solve this problem of sulfur burning by making less frequent and lighter applications during the hot weather, which is usually dry as well as hot. Others find it necessary to continue treatment and some turn to a copper-containing spray or dust as a substitute for sulfur, returning to the latter as soon as the temperatures are lower. The general complaint against the continued use of copper-containing materials is that they cause injury, either visible burn to the foliage or a stunting of the growth. Some of our new materials such as Fermate and Dithane may supply the answer to the problem of injury. These materials are being tested this season.

As a final suggestion one should familiarize oneself with the diseases and pests that regularly infect the garden and plan accordingly. These vary from garden to garden with respect to occurrence, prevalence and severity. It will be found that black-spot appears at about the same time each year, and knowing this, one will be guided as to when to start control measures. Mildew may or may not be a problem, depending on garden site and varieties grown. Insect pests are also variable as to their occur-

rence and prevalence. It is important that the gardener make disease and insect control a regular part of his cultural practices and in this way avoid both epiphytotics and epidemics. It is easier to keep the garden clean than to work under the disadvantage of overcoming outbreaks after they get well under way. If you haven't already put your disease and pest control on this routine basis you will be surprised to find how easy, and how simple, it all is.

Canker-Blight of Pachysandra

By B. O. Dodge

A New Fungus Causing an Old Disease

OUR recent work on canker and blight of boxwood [1] has naturally led to a study of canker and blight of *Pachysandra,* which is closely related to *Buxus.* Ordinarily pachysandra is rather free of diseases and insect pests. This may be one of the reasons for the popularity of this plant as a ground-cover. Although scale insects sometimes infest it and canker- and leaf-blight caused by species of *Volutella* have occasionally been reported as causing considerable damage, these troubles have seldom been considered serious.

However, last spring T. H. Everett, the Garden's Horticulturist, called our attention to an especially serious case of canker-blight in a planting at Bronxville. He noted that the trouble was much more pronounced in those areas where men had walked about while cutting down a tree at the corner of the lot. The disease was manifested by the presence of many dead or dying stems which showed cankers several inches long or which were dead at the tip ends for several inches downward. The fungus disease had spread to some extent to plants in another part of the lot. When this canker-blight occurs, innumerable spores are produced in little cushion-shaped bodies which develop freely on the infected stems as well as on blighted leaves. The disease would spread more rapidly in the average planting were it not for the fact that the fungus is of the type called a wound parasite. It is abrasions caused by insects or by winter injury of leaves and tip ends of stems, or mechanical injuries of various sorts, which open the way to infection by this fungus.

The spore-bearing structures which were either present at the time Mr.

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[1] Dodge, B. O. Boxwood blights and *Hyponectria. Mycologia* **36**:215-222. 1944.
..... *Volutella Buxi* and *Verticillium Buxi. Mycologia* **36**:416-425. 1944.

Everett brought his specimens in for study, or which developed shortly thereafter in damp chambers, proved to be decidedly unlike those of the fungus which was originally described as causing a similar disease and named *Volutella Pachysandrae* by Hutchinson.[2] Others had observed this difference too.[3]

Pure cultures of the fungus that developed on this material were obtained. Cuttings from healthy plants were sprayed with spore suspensions. In some cases the leaves were wounded by clipping off the tips, and in addition to the cut ends of the stems other wounds were purposely made. It was found that brown discolored areas developed first only on the wounded parts of the plant, then spread rather quickly along the stems and into the leaves. Where spores were placed on areas of leaves and stems which were not wounded, no infection occurred except where a leaf was kept long in contact with the moist filter paper bearing spores of the fungus. Many pustules with characteristic spores developed within a few days. These experiments prove that this disease is primarily a wound parasite caused by an undescribed species of *Volutella*.

Mr. Everett volunteered to carry out some experiments to see if further spread of the disease in the Bronxville planting could be prevented. All diseased stems and leaves, so far as practicable, were gathered and burned. All the remaining plants, as well as the areas of soil laid bare where the dead plants had been removed, were sprayed with Bordeaux mixture. Three applications were made at intervals of a few days necessitated by the frequent rains during that period.

Since this fungus is primarily a wound parasite there is good reason to believe that new growth will cover the bare areas. Or, if new well rooted cuttings with the cut ends well calloused are set in, the planting may be restored with growth that will not necessarily become infected. We have as yet no evidence that the fungus can act as a soil organism which may attack the pachysandra roots.

The fungus is apparently widely distributed in this vicinity. Cankered or dead stems and leaves bearing the fungus can usually be found in almost any planting, even though practically all the other plants may be in fine condition. Dr. Cynthia Westcott has reported to the writer that the disease occurs frequently in New Jersey, especially where plants have been injured. Dr. A. B. Stout brought in some fine specimens from Pleasantville, N. Y.

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[2] Hutchinson, W. G. An undescribed species of Macrophoma and of Volutella occurring on Pachysandra terminalis. *Mycologia* 21:131-142. 1929.

[3] We have just recently received letters from Dr. Freeman Weiss of the U. S. Department of Agriculture in which he pointed out that the late Dr. G. P. Clinton as well as Drs. R. P. White and P. P. Pirone of the New Jersey Agricultural Experiment Station had previously noted the same discrepancy. We are much indebted to Drs. Weiss and Pirone for their co-operation in this matter and shall discuss more fully the points mentioned in these letters in another publication.

Both Mr. Everett and Louis Politi, Arboretum Foreman, on seeing the results of our infection experiments in the laboratory (below), remarked that in times past they had lost numerous cuttings in their propagating benches, apparently from the same disease. The leaves from which the tips had been cut frequently turned brown, they said, and no new leaves developed. Or the cut ends of the stems decayed from a brown rot so that no roots formed.

It is clear that cuttings should not be taken from plants where the disease is evident. In any event, as a further precaution, it may be advisable to avoid clipping the leaves. The cutting knife should be dipped in alcohol after it has been used to trim off dead stems or leaves. Furthermore, one should avoid planting pachysandra in unfenced areas where the milkman, small sons, neighbors and sightseers naturally walk through the planting to make short-cuts. As a last resort, apply Bordeaux mixture, or other fungicide, if the plants begin to show blighted tips or stem-cankers. Since Bordeaux in the powder form is apt to deteriorate if kept a long time, and home-made Bordeaux is not easily prepared when large crystals of blue vitriol (copper sulphate) are used, it will be found that "instant Bordeaux"

RESULTS OF ARTIFICIAL INFECTION OF PACHYSANDRA LEAVES AND STEMS

Left: The leaves and cut stems of this plant were sprayed with Volutella spores. The dead areas show that the fungus enters leaves and stems through wounds. The leaf at the left was wounded by clipping off the tip; that at the right became infected only as the fungus penetrated the base of the leaf stalk, having first gained entrance through the cut end of the stem.

Right: Progress of the disease after ten days. Both pieces of stem had been well sprinkled with spores, but infection occurred only through the cut ends.

STEMS OF PACHYSANDRA INFECTED WITH THE VOLUTELLA PARASITE

Left: The result of artificial inoculation.

Center: A portion of cankered stem that was infected in nature. The small light-colored spots represent the spore-bearing structures of the fungus. These two stems are enlarged about 2.5 diameters.

Right: A dead stem bearing many mature ascocarps of the "perfect stage" of the parasite, most plainly seen along the edge at the right above. The light-colored dots are spore pustules of the Volutella stage of this fungus, the same as those that are shown at the center and left. Enlarged about 3.5 diameters.

can be prepared quickly and easily by using the whitish monohydrate form of copper sulphate. In this case use the same amount of hydrated lime, but only half as much of the copper sulphate, or 2:6:50 instead of 4:6:50.

The Perfect Stage of the Volutella Parasite

When we first inspected the Bronxville planting mentioned above, we found on old dead stems not only the spore pustules of the fungus *Volutella,*

which has been proved to be the cause of the disease, but also many beautiful bright orange-red to dark red ascocarps of a fungus which would be classed in the family Nectriaceae. These fungous "fruit bodies" clearly represent the perfect stage of the *Volutella* and as such are of great interest. This species of ascomycete has not as yet been described. Quantities of this stage have since been collected from various plantings. Single ascospore cultures were obtained. Characteristics brought out in culture experiments indicate that the *Volutella* is the imperfect stage of this nectriacious ascomycete. This fungus will be discussed in a forthcoming number of *Mycologia,* where a formal description of the species will be published along with figures illustrating further the diagnostic characters.

Fred Sparks Addresses Graduating Gardeners

GRADUATING exercises for six students who had completed the six terms of required study and practice in the Two-Year Course in Practical Gardening took place at the New York Botanical Garden the evening of June 22. A certificate also was presented to Martin F. Flayter who had completed the Two-Year Science Course for Gardeners. The graduates in Practical Gardening were J. Cyril Fullerton, Erika Coudenhove-Kalergi, Hanna Rachwalsky, Katherine J. Rauch, Magdalen Rauch, and Alfred P. Schmidt.

Fred Sparks, Superintendent of the estate of Mrs. Bayard Cutting at Oakdale, L. I., and a past president of the National Association of Gardeners, gave the graduating address.

"You have become members of the largest and oldest fraternity upon earth," he told the students.

"From earliest Biblical days to the present time, those who garden, and those who write of gardening, and when I say write, I include those who teach this art, have formed an absolutely essential group in the development of the human race.

"I have referred to them as a fraternity, and I think there are few professions in which the participants show a closer or more kindly regard for each other's welfare.

"By this I do not mean that they lack a competitive spirit, but it is a kindly and tolerant spirit of emulation, lacking the ruthlessness which often seems to permeate the competition of the industrial and commercial world.

"In this world of plant life you have a common meeting ground, and by it, close kinships have been formed between people of high and low degree, and widely differing tastes in other lines."

Mr. Sparks then told two stories of how an interest in plants had affected two well known men—in one instance how the whole course of the man's life was altered.

"The late Charles Totty," he said, "told me once of an occasion when he was a delegate to a bankers' convention in a midwestern state. He had listened during a hot afternoon to an endless recital of figures and facts regarding the problems of banking, and was feeling decidedly bored with it. As he walked down the street at the close of the session, he suddenly espied a banner across the street advertising a state florists' convention. He quickly entered and found himself with a group of people who spoke a language which he both understood and

enjoyed. To use his own words: 'That florists' convention saved my life.'"

The second story was about the late Henry W. de Forest, who for ten years was President of the Board of Managers of the New York Botanical Garden. "When traveling up from the south during a spring of several years ago," he said, "Mr. de Forest made a comment to a fellow traveler upon the character of the vegetation of the country through which they were passing. One remark led to another, each one of a horticultural character, and within a short time they introduced themselves to each other. Mr. de Forest discovered that his companion was Mr. Edwin Jenkins of Lenox, Massachusetts, one of this country's best known gardeners, possessing a profound knowledge of plant material and horticultural practice. There again, to quote the story-teller's own words, that journey northward was the 'shortest and most enjoyable' that he had ever made."

Mr. Sparks spoke of the divisions of horticulture, such as the growing of greenhouse crops and the various kinds of outdoor gardening, including cultivation of trees and shrubs, all of which are based on the same fundamentals, and said to the students: "You have been fortunate in obtaining instruction from teachers who are so well qualified to impart information. You see, I know them, and can assure you that I or any other gardener feel ourselves well advised when we get their opinion upon any horticultural problem."

After describing the many steps by which the professional gardeners of England have obtained their training, Mr. Sparks concluded:

"All this sounds arduous and exacting, which is correct, for there is a season for everything, and we must adhere to these rules; but it is a healthful occupation. The association with growing things, and the pride of growing them to perfection, as well as the close contact with nature all assist in bringing a peace of mind which seems so often lacking in the world of industry and commerce.

"Nature sometimes seems to be a perverse associate—wind and storms, frosts and hail, heat and drought, in addition to insect pests and diseases, will furnish many discouragements; but I have yet to find a real horticulturist who has quit the game or become embittered with the opposition.

"As one gardener to another, I congratulate you upon your success and wish for its continuance throughout your life. I couple with it the hope that you will always avail yourselves of the help and instruction which institutions like the New York Botanical Garden and its staff of teachers offer to you, and thus refresh your knowledge with the latest discoveries in your field of work."

About fifty relatives and friends of the graduates, also their instructors and several staff members at the Garden, gathered for refreshments in the rotunda of the Museum Building after the certificates had been presented by Dr. William J. Robbins.

South American Report

LETTERS and plant materials from South America received last month from Dr. Bassett Maguire all indicate that the New York Botanical Garden's Tropical Expedition of 1944 is bringing results even beyond expectations, and that, in addition to the plant collections, valuable new friendships are being made with the botanists of British and Dutch Guiana (Surinam).

After collecting 200 numbers in the Essequibo bush, Dr. Maguire writes that he obtained nearly 600 numbers that should average six specimens each from the Kaieteur plateau. "Things were in their prime," he says. "I don't believe we missed a dozen woody plants because of failure to get them in flower or fruit or both. We got many Roraima plants."

Writing later (June 9) from Paramaribo, he tells of preparations for the long trip into the interior and up to the unexplored plateau of Table Mountain. A few days earlier he had been able to fly over the mountain and at close range to locate three good campsites, to map the approach to the mountain, and to select the route for the ascent. Later, Dr. Gerold Stahel, Director of the Agricultural Experiment Station in Paramaribo, who has played an extremely important part in paving the way for the success of the trip, will visit Dr. Maguire by plane on the mountain top, and on appointed days, supplies will be dropped to him

from parachutes. A radio also is to be dropped, and pilots of Pan-American Airways who fly nearby have been instructed to listen for the wave-length as they pass that way.

Continuing his letter on June 12, Dr. Maguire writes: "We are now half a day's run up stream. The Saramaca is one of the smaller and more beautiful streams of Surinam. At this point it is hardly more than 500 feet wide. We have not yet gotten out of the coastal low bush into the high bush of the interior. None-the-less, the river banks are constantly full of interest. . . . [An] immediate study [to be made by Dr. D. C. Geijskes, assistant to Dr. Stahel] . . . that will supplement our work nicely is a study of lower river vegetation for the entire colony. Geijskes is going to collect for us in his further work along the coastal area."

On the first two days of the trip up the Saramaca River in the government motor launch *Wanica,* Dr. Maguire was accompanied by Dr. Geijskes. The rest of the way his only companions are seven Carib Indians. After leaving the motor launch at the first rapids, the trip continues in six dugout canoes, each 25 to 35 feet long, then on foot through the jungle, cutting the way to the base of the mountain and to the ancient landslide by which the top will be reached. He expects to arrive on the mesa shortly after Aug. 1.

Notes, News, and Comment

Fellowship. Dr. Margaret Fulford, Assistant Professor of Botany at the University of Cincinnati, is spending the summer at the New York Botanical Garden as the recipient for the second successive year of the Marshall A. Howe Fellowship for research in the lower forms of plant life. She is continuing her studies of the liverworts.

Visitors. Dr. Stanley A. Cain, Professor of Botany at the University of Tennesse, is spending three weeks at the Garden investigating further problems in plant geography. His book, "Foundations of Plant Geography," for which he did considerable research at the Botanical Garden, particularly while working under a Guggenheim fellowship in 1940-41, was published by Harper's in May, and it will be reviewed in an early number of this Journal.

Dr. Alan A. Beetle of the University of California is spending July at the Garden in research on the genus *Scirpus.* He has received a month's scholarship. Dr. H. J. Muller, Chemist at the Agricultural Experiment Station in Paramaribo, Surinam, who is in this country for three months, visited the Garden July 1 and went through Dr. Robbins' laboratory.

Other visitors of recent weeks have included Donald Culross Peattie, Santa Barbara, Cal.; Shu-Huang Ou, Chungking, China; Raymond L. Taylor, College of William and Mary; L. L. Kumlien, Dundee, Ill.; Gertrude S. Burlingham, Winter Park, Fla., and Newfane, Vt.; Louise Clermont, Cincinnati; and Gabriele Nutile, Jr., North Haven, Conn.

Degree. Arthur Cronquist returned to the Garden late in June after a month spent in Minneapolis, where he received the degree of Doctor of Philosophy from the University of Minnesota. He received his M.S. degree from Utah State College in 1940. His Ph.D. thesis, "Revision of North American Species of *Erigeron,*" will be published, it is planned, in *Brittonia,* but not until after the paper shortage is relieved. Dr. Cronquist has been appointed Assistant Curator at the Garden beginning July 1.

Movie. The Garden's motion picture was shown to the Women's Club of the Bedford Park Presbyterian Church May 22 by Elizabeth C. Hall; to the Masonic Lodge of Hartsdale, N. Y., May 24; and to the Business and Professional Women's Club of Christ Church at the Garden June 17 by Dr. E. E. Naylor.

Lectures. Dr. Fred J. Seaver addressed the Millbrook (N. Y.) Garden Club, an Affiliate of the Botanical Garden, at Sharon, Conn., June 15 on "Fungi in their Human Relations." E. J. Alexander spoke on "Gardening with Wild Flowers" before the Riverdale Garden Club, also an Affiliate, May 23.

Brooklyn. Dr. George S. Avery, formerly Professor of Botany at Connecticut College, became Director of the Brooklyn Botanic Garden July 1, succeeding Dr. George S. Reed, Acting Director, who took office shortly after the death last August of Dr. C. Stuart Gager, who had been Director since the foundation of the Garden in 1910.

Photographers. The Biological Photographic Association is having its annual meeting in Binghamton, N. Y., Sept. 7-9. The meeting will be featured by round-table discussions and by a salon of pictures made by biological photographers.

Director. A. C. Pfander was elected a director of the American Rock Garden Society at the annual meeting May 20.

Knighted. Prof. Alexander Fleming of London and his assistant, Prof. Walter Howard Florey, were knighted in the King's birthday list issued June 7 this year for their discovery and development of penicillin. The discoverer of the wonder drug produced by a mold thus becomes Sir Alexander, and his assistant, who has helped in developing the product, becomes Sir Howard.

Groups. School children from Public Schools 5 (Manhattan) and 33 and 96 (Bronx) made special tours of the Garden during June. Other groups that visited the Rock Garden, Rose Garden, Conservatories, and Museum include the Netherlands Aid Society, Girl Scouts from Battle Hill School, White Plains, and members of a Teachers' College course in Application of Science in New York City.

Washington. Dr. H. W. Rickett spent several days in Washington early in June, looking up library references for *North American Flora.*

Technical Assistant. Selma Kojan becomes Technical Assistant in the laboratory of Dr. A. B. Stout July 15, to succeed Anita Appel, who has resigned to take a position at Bellevue Hospital and to study bacteriology. Miss Kojan assisted in breeding research at the Garden as a volunteer and under scholarship grants in 1939 and 1940. Previously she worked for over a year as a volunteer gardener. She was graduated from the University of California in June with a B.S. degree, having majored in genetics and plant breeding. She is the author of an article on "Flowering Periods for Clonal Varieties of Daylilies" which was published in *Herbertia* in 1940.

Notices and Reviews of Recent Books

(All publications mentioned here may be consulted in the Library of The New York Botanical Garden or may be purchased on order through the Library.)

The Small Farmer's Way of Life And How It Can Be Improved

ROOTS IN THE EARTH — The Small Farmer Looks Ahead. P. Alston Waring and Walter Magnes Teller. 198 pages, illustrated, indexed. Harper & Brothers, New York. 1943. $2.50.

THIS is no seductive appeal to city folk to abandon the madding crowds' ignoble strife and seek peace and plenty and independence on the land. The authors have no objection to gentlemen taking to farming if they can afford it but have no illusion that farming can be made a profitable pastime or that peace and plenty and independence can be won from the soil without a bit of capital and a lot of very hard work. Rather this is an appeal to city folk to understand the importance of small farming and small farmers and some of the problems which beset them. Half the farmers of this country produce 85% of the nation's food; the other half produce only 15%. The latter group have a miserable enough time of it.

The two authors are honest-to-goodness farmers. I have seen them at work and know the very active and unusual role which they and their wives play in their rural community. The ideas which they put forth in this bright and realistic

little volume are ideas which they have tried and made to work. They believe that the farmers on the little farms should give up aping their big neighbors and stop trying to be commercial farmers. They believe that the small farmer and his family should secure more of his food from his own place and thus get better quality and variety. They would augment this through co-operative buying of fuel and processed items and individual or co-operative facilities such as deep freeze lockers and co-operative use and ownership of the larger farm machinery. They want more help from their government particularly in such matters as credit facilities (FSA) and scientific and practical guidance as to crops and methods (USDA) but they are prepared to work hard and work together. They want governmental guidance but they want to be the local part of that government. They believe that 200,000 big farmers have dominated the Farm Bloc and the Farm Bureau Federation and much governmental activity on behalf of agriculture and that the 3,000,000 farm families have not had sufficient voice in what has been done. They want to preserve the family farm as a way of life but they want it to be efficient without aping the big farm.

In advocating "home production for home use" they are not advocating subsistence farming. They do not want to be out of the main stream of American life. They want to enjoy the products and gadgets of our industrial age. They know that it costs money to buy them and to have money they must have products to sell. They urge the small farmer to produce most of his family's food and his live stock feed as a means of attaining greater security. With it they urge cash income from at least two sources, conservation and judicious use of his soil and the substitution of co-operative effort for his rugged individualism.

The authors modestly tell us that "the pressures and confusions of the modern world are so great that it is hard to think clearly, and we labor under the difficulty of trying to see a big situation from our farms and little local communities." But they state their case with a conciseness and clarity rare in the discussion of this or any other pressing public problem.

JOSEPH D. MCGOLDRICK,
Comptroller, City of New York, and
Farmer, New Hope, Pa.

Civilization in Terms of Nourishment

SIX THOUSAND YEARS OF BREAD. H. E. Jacob. 399 pages, illustrated, indexed, bibliography. Doubleday, Doran & Co., New York. 1944. $4.50.

"Six Thousand Years of Bread" is in effect a "History of Civilization." The divisions of the book are made according to historical eras, carrying us from the days of prehistoric man to our immediate present. The emphasis is always man's relation to his food, or bread; man's dependence on grain and agriculture, man's use of bread as a religious symbol, man's poetic response to hunger and want and his joy in health and plenty.

The author knew the want of bread when in prison in Buchenwald. He has known the joy of tasting real bread again in America. He has attempted to write history in terms of our important food—bread, an undertaking which necessitated an immense amount of bibliographical research.

Mr. Jacob wrote the book in German. It has been translated by Richard and Clara Winston.

CHRISTINE CHAPMAN ROBBINS.

Outline of an Era In Exploration

EARLY NATURALISTS IN THE FAR WEST. Roland H. Alden and John D. Ifft. 60 pages, illustrated, map, bibliography. Occasional Papers of the California Academy of Sciences, No. 20. San Francisco, 1943. $1.

This is a much too brief account of a subject that could fill volumes. In less than sixty pages is packed the story of the early western naturalists, Spanish, Russian, French, and English. With superb courage and utter disregard of physical comfort—scarcity of food, constant threat of Indian attack—they explored the Pacific coast of the North American continent. Many of our plants and birds bear the names of these naturalist-explorers; it is an honor roll that stretches through the centuries, and includes such names as Cook and Humboldt, Chamisso, Nuttall, and Lewis and Clark. Like the ant, these men by the laborious accumulation of small particles, created a mountain. In this age of experimental science, little attention is given by the modern biologist to the naturalists

upon whose work his science is based. This brief brochure covers the period between the conquest of Mexico in 1519 (when Cortez found botanical and zoological gardens unlike any that were known in Europe at that time) to 1840 when the U. S. Exploring Expedition under Lieut. Wilkes, U.S.N., marked the beginning of a new era in the development of the Far West.

Messrs. Alden and Ifft are to be congratulated on their masterly treatise. It is to be hoped that they will see their way to writing at greater length on this suggestive and pregnant subject.

AMY SPINGARN,
Amenia, N. Y.

Life of a Famous Naturalist

WIDE FIELDS — The Story of Henri Fabre. Irmengarde Eberle. 193 pages, illustrated by Fritz Eichenberg. Thomas Y. Crowell Co., New York, 1943. $2.50.

Outstanding workers in science are one of the newer interests for younger readers of biographies, and fictionized biography is one of the newer forms. The two combine well in "Wide Fields" and I suspect that there will be adults glad of this short and pleasant way of knowing Henri Fabre.

Fabre's life was the story of a man working always—and always working—under the pressure of his own need for knowledge. This is the theme Miss Eberle has emphasized from the time he was a little child on his grandparents' farm till he was an old, dying man. This great need to know the world about him enabled him to surmount all difficulties while his complete lack of self-interest, except where his work was concerned, never faltered. Interested in many things, the lives of insects proved the one subject which received his complete devotion.

If the biography were not fictionized, no child, I think, could read through the details of self-respecting but deadly poverty which haunt almost every page. As it is, the happy family life, the interest in the intellectual life of boys and girls, his friendships with humble and great, carry one over what might be both dreary and depressing.

JANNETTE MAY LUCAS,
Author of "Fruits of the Earth" and other books for children.

Savor of Life In an Earlier Day

HERBS FOR THE MEDIEVAL HOUSEHOLD: For Cooking, Healing, and Divers Uses. Margaret B. Freeman. 48 pages, illustrated, indexed. The Metropolitan Museum of Art, New York. 1943. $1.50.

This little book is pure joy for anyone who loves herbs, or books. Every plant mentioned is illustrated by an old woodcut; chapter headings and introduction are adorned in the same way. The type, printed in black and red, is skillfully chosen to harmonize with the figures, to have a medieval aspect without being illegible. The whole work is managed without effort or affectation.

To read these pages is to look through a window into the past, into the intimate daily lives of our European ancestors. The flesh was afflicted then as now by such ills as a "harmful wicked moistness of the lung" and a "cold humor in the head"—ills which we now describe in mongrel Greek and Latin. Bad breath was a problem before halitosis was heard of—and the herbalists knew what to do about it. The remedies prescribed are only less astonishing than the faith in them—which still makes quackery the most profitable medicine.

It is pleasant to read of rose water used for washing hands at meals and rose petals spread among clothes in chests. Have we lost some of the savor of life?

In an age of mass production it is as rare as it is welcome to find a book well designed and well written, at the same time scholarly and a work of art. Miss Freeman, the Museum, the printer, and anyone else who had a hand in it deserve congratulations.

H. W. RICKETT.

American Food and Fiber Plants

WORLD CROPS DERIVED FROM THE INDIANS. Edwin F. Walker. 16 pages, indexed. Leaflet No. 17, The Southwest Museum, Los Angeles, 1943. 20 cents.

A concise, historical, compact account of our food and fiber plants of American origin, indicating a remarkable contribution inherited from our American Indians. These economic contributions represent more than half of the present agricultural wealth of the world. An excellent article, one which should be in the hands of every school child.

G. L. WITTROCK.

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To reach the Botanical Garden, take the Independent Subway to Bedford Park Blvd. station; use the Bedford Park Blvd. exit and walk east. Or take the Third Avenue Elevated to the Bronx Park or the 200th St. station, or the New York Central to the Botanical Garden station.

PUBLICATIONS OF THE NEW YORK BOTANICAL GARDEN

Books, Booklets, and Special Numbers of the Journal

An Illustrated Flora of the Northern United States and Canada, by Nathaniel Lord Britton and Addison Brown. Three volumes, giving descriptions and illustrations of 4,666 species. Second edition, reprinted. $13.50.

Flora of the Prairies and Plains of Central North America, by P. A. Rydberg. 969 pages and 601 figures. 1932. Price, $5.50 postpaid.

Plants of the Vicinity of New York, by H. A. Gleason. 284 pages, illustrated. A handbook especially compiled for the beginner in plant identification. 1935. $1.65.

North American Cariceae, by Kenneth K. Mackenzie, containing 539 plates of *Carex* and related plants by Harry C. Creutzburg, with a description of each species. Indexed. 1940. Two volumes, 10¾ x 13½ inches; bound $17.50; unbound $15.50.

Keys to the North American Species of Carex by K. K. Mackenzie. From Vol. 19, Part 1, of *North American Flora*. $1.25.

Plants of the Holy Scriptures by Eleanor King, illustrated, and accompanied by a list of Plants of the Bible with quotations, in the March 1941 Journal. 15 cents.

Food and Drug Plants of the North American Indian. Two illustrated articles by Marion A. & G. L. Wittrock in the Journal for March 1942. 15 cents.

Vegetables and Fruits for the Home Garden. Four authoritative articles reprinted from the Journal, 21 pages, illustrated. Edited by Carol H. Woodward. 1941. 15 cents.

The Flora of the Unicorn Tapestries by E. J. Alexander and Carol H. Woodward. 28 pages, illustrated with photographs and drawings; bound with paper. 1941. 25 cents.

An Herbal. First published by Richard Banckes in London. 1525. Edited and transcribed into modern English with an introduction by Sanford V. Larkey, M.D., and Thomas Pyles. 200 pages, including facsimile of original. Prepared by Scholars' Facsimiles and Reprints. 1941. Price to members of the Garden, $2.50; to others, $3.50.

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Succulent Plants of New and Old World Deserts by E. J. Alexander. 64 pages, indexed. 350 species treated, 100 illustrated. Bound in paper. 1942. Second edition 1944. 50 cents

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

SOME UNCONSIDERED ASPECTS OF PENICILLIN

PENICILLIN, the drug which has made it possible for doctors to combat some of the greatest scourges of mankind, was discovered in 1929 by Professor Alexander Fleming in London, and was developed as a therapeutic agent by Professor Walter Howard Florey in 1940. While these two men have been knighted for their accomplishments, many less honored scientists have contributed in no small degree toward making available to the world this powerful curative agent.

The story of penicillin has been told and retold, but there are certain aspects of its discovery and development which are not usually considered. Why was it not discovered earlier—a century earlier, for example? There are many reasons.

First, the jelly-like, semi-solid, agar medium, such as the one which Professor Fleming was using at the time of his discovery, was not known to scientists in 1829. Without such a medium for the culture of bacteria, Fleming could not have made the original observations on which his discovery was based.

Second, the genus *Penicillium* was scarcely known in 1829. Three species of it were described in 1809. By 1911, sixty were recognized, among them *P. notatum*, source of penicillin. In 1930, Dr. Charles Thom included descriptions of 678 species in his monograph of the genus.

Third, in 1829 the world knew almost nothing about bacteria. They had been seen, but their relation to disease was not yet understood. People had septicemia, pneumonia, and all the other devastating diseases that are bowing today before effectiveness of penicillin, but nobody then knew definitely what caused them, and either death or long suffering was certain.

Fourth, methods of pure culture—that is, methods of growing a single kind of bacterium or mold by itself without the presence of other kinds—were unknown in 1829. Cotton plugs for bacteriological apparatus—so important for maintaining pure cultures—were developed in 1854 from experiments performed on spontaneous generation. Without pure cultures, penicillin could not be produced.

Progress in science is like the progress of the Russian army. It is not a single knight in armor who advances and slays the enemy, but it is a great coordinated movement of many individuals each specially equipped to do his job. Without the scientific developments of the past century (of which those mentioned here are but a small fraction), the discovery and development of penicillin in the 20th century would have been both impossible and pointless.

WILLIAM J. ROBBINS

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Cover photograph by Elmer N. Mitchell

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Rosybloom Crabapples for Northern Gardens

A New Race of Hardy Ornamental Hybrids Originated at the Central Experiment Farm in Ottawa

By Isabella Preston

THE name "Rosybloom Crabapples" was given by the late Dominion Horticulturist, Dr. W. T. Macoun, to a group of hybrid crabapples that were originated at the Central Experimental Farm.

The number of flowering trees and shrubs that are hardy in the colder districts of Canada is limited and those with purplish coloured foliage like *Prunus cerasifera* var. *Pissartii* and *Fagus sylvatica* var. *atropunicea,* the purple beech, are not hardy even at Ottawa. There is a need for plants with coloured foliage to give variety in the shrubbery border, so hardiness and purple foliage and, of course, attractive flowers were the aims set for the project.

One of the parents chosen was *Malus pumila* var. *Niedzwetzkyana,* which has purplish foliage, deep rose flowers and medium-sized apples of deep maroon or purplish colour. It is not an attractively shaped tree and

---

* Miss Preston, who is Assistant in Ornamental Plant Breeding at the Central Experimental Farm, Ottawa, Ontario, has long been known for her successful work in the hybridizing of lilies, late-blooming hardy lilacs, Siberian irises, and hardy shrub roses. Her production of hardy hybrid ornamental crabapples, however, has not yet met with wide attention. The Journal of the New York Botanical Garden, therefore, asked Miss Preston to prepare some descriptive notes, and as a result is privileged to present here one of the first descriptions of the "Rosybloom Crabapples" that has appeared in the United States. These spectacular hybrids were first listed here in "Crab Apples for America" by Donald Wyman, published in 1943 by the American Association of Botanical Gardens and Arboretums. The present paper is Contribution No. 635 from the Division of Horticulture, Experimental Farm Service, Ottawa.

Among numerous articles and papers which Miss Preston has written are booklets on annuals, herbaceous perennials, and shrub roses, issued by the Dominion of Canada Department of Agriculture. She is also the author of "Garden Lilies," a book published by Orange Judd of New York in 1929.

Some of the original trees of the Rosybloom Crabapples are shown here. From left to right they are "Cowichan," "Amisk," "Chilko," and "Muskoka." All of this group of hybrids are named after Canadian lakes.

is damaged in very severe winters. The other parent was *Malus baccata,* which grows into a large round-headed tree with green foliage and masses of white flowers. The fruits on our specimens are small yellow crabapples. This species is extremely hardy.

Between these two species many cross pollinations were made by the writer in 1920 and a number of fruits set. Unfortunately, the trees used as parents were growing on lawns where they were easily seen by the public. The large maroon apples on the Niedzwetzkyana tree proved too attractive to someone and all except four of the hand-pollinated fruits were stolen. At the top of the tree there were a few apples left so these were gathered and the seeds harvested. It is from these open-pollinated seeds that most of the varieties have been grown. It was evident when these seedlings grew and bore fruit that bees had cross-pollinated the flowers with pollen from a hybrid growing nearby. It was a *Malus baccata* hybrid which was covered with white flowers each spring.

More than one hundred seedlings were grown and at the end of five years all those with green foliage were discarded. The trees that were saved have the purplish colour of Niedzwetzkyana in the stems, leaves and flowers, though the amount varies in different varieties. In spring all have purplish-red foliage which turns greener during the summer although traces of the red can always be seen. In autumn several of the varieties have brilliantly coloured foliage. The flowers are deep pink, which fades but never turns to white. The fruits vary in colour, size and shape.

As mentioned above, these plants were bred for ornamental purposes but many of them have fruits that make bright red jelly of good flavour. Some

of the larger-fruited ones have interested commercial fruit growers who wish to plant them for the canning factories. Several of the small-fruited varieties make good jelly and are more ornamental than the larger-fruited kinds, because they are more floriferous.

The date of blooming varies with the season. If the spring is early the trees bloom in early May, but in a late season it may be the third week before they flower. The individual trees bloom for eight to ten days and there are about ten days between the first flowers of the earliest blooming variety, ***Chilko,*** and the latest, ***Sissipuk.*** Some bloom profusely every year but others bear very few flowers in alternate years.

Like all apple trees, these are subject to diseases and insect pests, therefore routine spraying is necessary to keep them in good health.

The names of them are taken from Canadian lakes.

The original plant of "Simcoe," tallest of the Rosybloom Crabapples. It flowers every other year.

Varieties of Rosybloom Crabapples

Amisk is an early-flowering variety with very ornamental fruit which looks more like a large rose-hip than an apple. The fruits are useless for cooking and they fall early. Alternate bearer.

Arrow is classed as a late-flowering variety. It has very dark buds and flowers which completely cover the tree and are followed by oxblood red small crabapples which hang on until late. Annual bearer.

Athabasca is early and has large rose-pink flowers followed by attractive carmine fruits which fall early. Alternate bearer.

Chilko is the earliest to bloom and is also the most fragrant. The fruits are ornamental but fall early. If it bloomed every year this would be the best early rose-coloured one.

Cowichan is probably the best early one

"Erie" is one of the best in the year in which it flowers, and the fruits are ornamental too. This is the original plant, growing at the Central Experimental Farm in Ottawa.

"Makamik," of which the original tree is shown here, is one of the latest of the Rosybloom Crabapples in flowering, and is considered one of the most ornamental of them all, blooming every year. The flowers are rose-colour with dark veins.

and has many good qualities. It blooms profusely every year and bears a good crop of spectrum-red fruits which make good jelly. The foliage is brilliantly coloured in autumn.

Erie, in the year in which it flowers, is one of the best and is a mass of bloom, as the illustration shows. The fruits are ornamental but too bitter for jelly. It blooms in mid-season.

Geneva is one of the larger-fruited varieties which is being tested for commercial purposes. Compared with the small-fruited ones this variety does not bear sufficient flowers to be considered a good ornamental, though the blooms are large and dark red.

Makamik is one of the latest to bloom and the flowers are rose-colour with dark veins. The buds also are of a very rich colour. It is floriferous, being covered with bloom every year. The fruits are small oxblood red crabapples which hang on the tree all winter, but they are too bitter to be useful. This variety is considered the best as an ornamental flowering tree.

Okanagan is most like Niedzwetzkyana in appearance. The large fruits have a good flavour, are juicy, and make good jelly. The flowers are attractive but there are not sufficient of them to make the tree worth growing as an ornamental.

Rosseau has flowers similar to those of Arrow and Makamik bu tthe fruits are more ornamental, being carmine shading to light jasper red instead of being self-coloured oxblood red as in the others. It is an annual bearer.

Scugog, if it bore fruit every year, would rank high for its ornamental as well as for its edible qualities. The large ornamental flowers, which are freely produced in alternate years, are amaranth-purple in colour. The fruits are not quite so large as those of Geneva and Okanagan, measuring one and five-eighths by one and one-quarter inches. They are a brighter red in colour and are quite attractive growing on the tree. The flavour is fair and for a very hardy apple it is considered good. It makes excellent jelly.

Simcoe is an upright-growing tree, rather too large for an ordinary garden, but very ornamental when in bloom. It has cup-shaped flowers spinel-pink in colour and appearing early. The fruit also is attractive but falls early and is of no use for jelly. An alternate bearer.

Sissipuk shows very little sign of life when all the other varieties are in full leaf. The flowers also are late, not opening until the others are beginning to fade. For this reason it is a valuable variety as it lengthens the crabapple blooming season for a week or more. The rose-colour flowers, which are freely produced, are more star-shaped than the others. The fruits are very bitter small crabapples, oxblood red in colour, and hanging on all winter. Annual bearer.

Timiskaming was grown from seed which came out of the same apple as that of Sissipuk but the tree shows none of the peculiarities of that variety. It blooms well in alternate years. The flowers are spinel-pink with white centre and are two inches across. The fruits are similar to those of Sissipuk and are also too bitter to use.

Wabiskaw, while the other varieties all have a more or less spreading habit of growth, has branches that are almost perpendicular instead of horizontal, giving it an unusual appearance. The rose-colour flowers are borne in clusters all around the stem and many of them have extra petals that make them almost semi-double. The small fruits are carmine with greenish flushes. They have not been tested for jelly-making. The tree blooms every year but is not covered with flowers like some of the others.

* * * *

In 1932 a number of crosses were made between several of the varieties, with the hope of intensifying the colour of the foliage and obtaining plants that would keep their purplish colour all through the summer. Several of the seedlings do this and are now being propagated for further test.

A Forest Lover in the Caribbee Islands

III. On St. Vincent's Soufrière

By J. S. Beard

ST. VINCENT is one of the most southerly islands in the Lesser Antillean chain and forms part of the British Windward Islands Colony. It measures only about 18 miles by 11 but a large part of even this small area is too mountainous to be habitable. The island is dominated by a Main Ridge or mountain backbone which rises sharply from the sea in the south to Mount St. Andrew (2,433 feet) and runs slightly east of north through the Grand Bonhomme (3,193 feet) to the Morne Garu mountains and Richmond Peak (3,528 feet). Here there is a deep trough across the island, north of which rises the Soufrière as a solitary mountain, its highest point reaching 4,084 feet. This Soufrière is one of the two still intermittently active volcanoes in the Antilles, the other being Mt. Pelée in Martinique. It is known to have erupted in 1718, 1812 and 1902-03.

St. Vincent has had a dark and tragic history, which still seems reflected in the dull, grey stone of the towns and the sombre character of the people. The island seemed inhospitable and was not settled early. Till well on into the eighteenth century is was a stronghold of the aboriginal savages, the Caribs, whose numbers were reinforced by communities driven from other islands and by runaway negro slaves. Gradually a half negro, half Carib race grew up, known as the "black Caribs" (the term became a byword for ferocity), who raided all up and down the islands. In 1762 the British made a serious effort to colonise the island but were furiously resisted. Intermittent warfare continued for over thirty years until the last Caribs, about 5,000 in number, surrendered and were deported to Honduras Bay. Since 1797 peace has reigned in St. Vincent but the island is visited by destructive hurricanes at frequent intervals and is always overshadowed by threatening eruption from the Soufrière, whose last outbreak cost the lives of 2,000 people.

Sugar was of course the main crop in the heyday of the West Indies, but is today of minor importance, and has yielded pride of place to sea-island cotton and arrowroot. All of these are arable crops, a fact which gives them an advantage in the face of the frequent hurricanes. The St. Vincent landscape therefore has quite a different appearance from the tree-clad aspect of the other Windward Islands, and shows a vista of open rolling fields descending toward the sea. Landward, the mountains rear up ever more steeply. The cultivated fields climb as high as man's persistence and ingenuity can take them, but in the end the angle of slope is always too severe. The peasant is baffled by slopes of more than 45° and

in the high mountains plenty of ground is far steeper than this. Many of the southern valleys in fact are walled in at their head by sheer cliffs of solid lava. The upper limit of cultivation peters off gradually into forest through a zone of intermittently cultivated garden patches and of pastures having a curiously alpine look, where raspberries grow wild. Everything is wet and dank and of a lush green, for there is much rain and the soil is very rich.

About the patches of grass and bush stands the tall Antillean rain forest of GOMMIER (*Dacryodes excelsa*) and CHATAIGNIER (*Sloanea* species), a high, crowded, dense forest over 100 feet high with a rich flora of all classes of plants. The flora of the island—to which the flora of this rain forest is the greatest contributor—is one of the best known in the Lesser Antilles as there was an important botanic station here in earlier days. To St. Vincent, in fact, Captain Bligh and the *Bounty* first brought the South Sea breadfruit to be propagated and distributed in the West Indies.

The Flora of St. Vincent published at Kew in 1893 lists 1,150 species. Trees and shrubs number about 250. Besides the GOMMIER and the various CHATAIGNIERS, the rain forest contains a large palm—*Euterpe Hagleyi*—also *Ormosia monosperma* (a leguminous tree with reddish wood), *Manilkara Ricdleana* (one of the so-called "gooseberries"), *Simaruba amara* (bitter quassia), *Virola surinamensis* (wild nutmeg), *Licania ternatensis* (of the Rose family), *Hieronyma clusioides* (a euphorbia), and *Calophyllum antillanum* –they or their close relatives already familiar from the rain-forest regions of the other islands *—besides numerous members of the Lauraceae and Sapotaceae which are hard to identify. Smaller trees, shrubs, lianes, epiphytes and ground plants occur in great profusion and are too abundant to mention in detail.

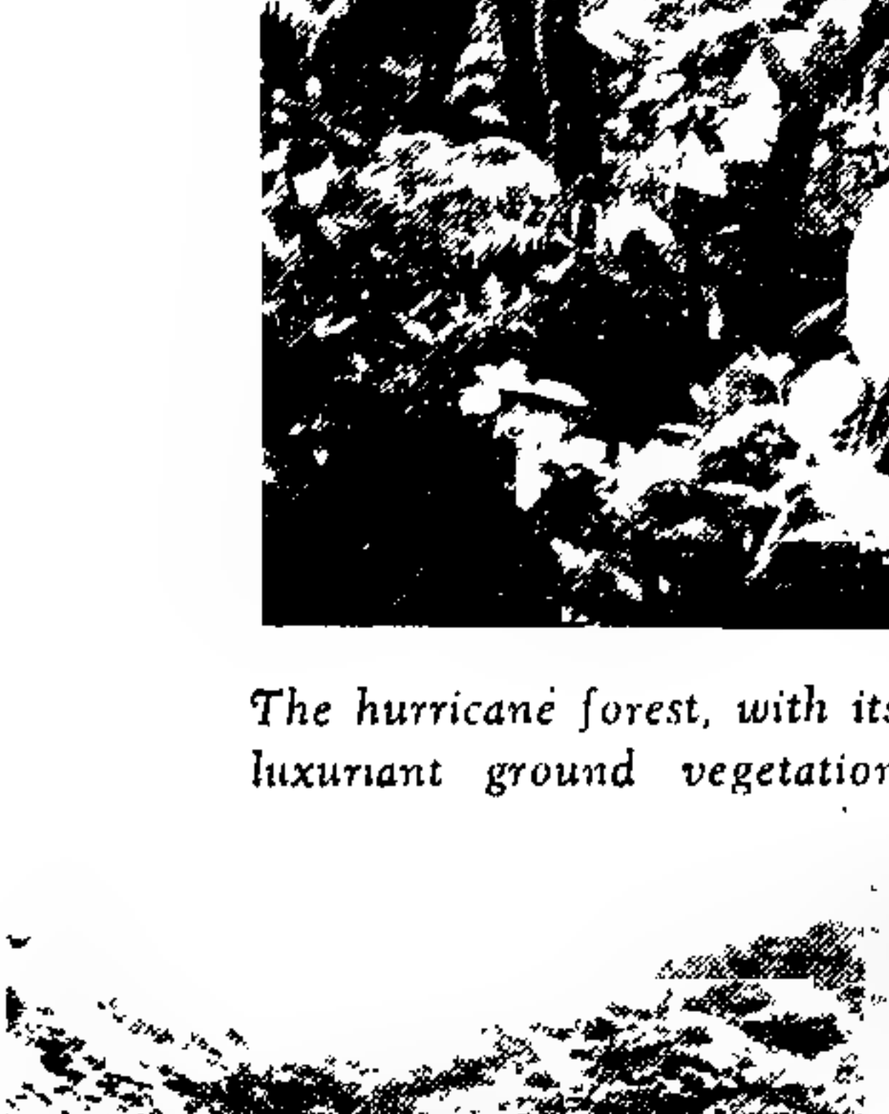
Unfortunately there is all too little of this fine forest in St. Vincent, as the hurricanes continuously threaten it with destruction and the mountains above about 1,600 feet elevation are almost wholly covered with a much lower, poorer, secondary growth called hurricane forest. As one ascends towards the Main Ridge the rain forest grows patchy. Big old trees of *Sloanea sinemariensis* are found standing isolated in young growth of *Inga ingoides,* a mimosa relative, *Cecropia peltata,* with large palmate leaves, and tree ferns, or there are young thickets of *Dacryodes excelsa* and other species mixed with much *Euterpe globosa* and *Inga.*

Soon after, regular hurricane forest is entered, though isolated big trees which have withstood the force of storms persist for a while. The hurricane forest consists of a low growth of trees from 40 to 70 feet high in which the palm *Euterpe globosa* is dominant, forming about 75 percent of the crop. The other trees here include *Trema Lamarckiana* (of the Elm

* See this Journal for May and June 1944, in which the forests of Tobago and Grenada are described.

The hurricane forest, with its luxuriant ground vegetation

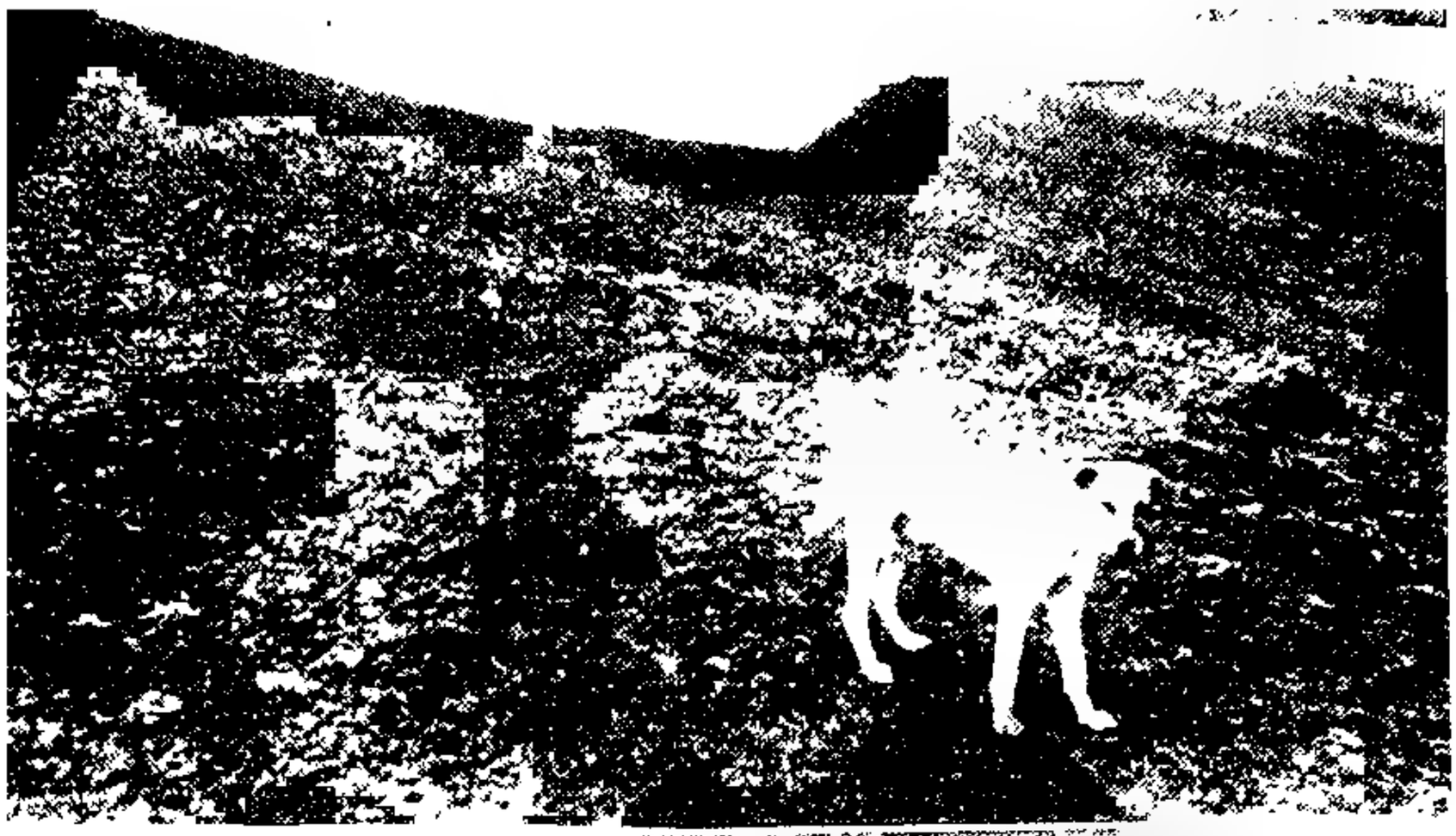
(Above) Tall secondary forest at the base of the Soufrière.



Tree-fern bush on the Soufrière at about 1,800 feet elevation.

(Left) Moss, lichens, lobelia, and pitcairnia at 2,700 feet.

(Below) Low-growing tree-ferns, silver-ferns, and charianthus, at about 2,400 feet.



Left: At the rim of the crater of the Soufrière, little can grow except mosses and lichens.

Right: A thousand feet below the rim of the crater of the Soufrière lies a deep green lake with sulphur crystals floating on its surface. The steep cliffs support a surprising amount of vegetation, chiefly ferns.

family), *Inga ingoides* and *Cecropia peltata* (trumpet-wood), which also occur in the intermediate region; *Richcria grandis* (a red-barked member of the Euphorbia family), and species of *Ficus* and the aromatic genus *Clusia.* All of these are quite small as trees go, and are crooked and forking or branchy. The non-woody vegetation here is certainly the most interesting. Shrubs are few but the ground-layer is tremendously luxuriant and forms a dense waist-high tangle of dank herbaceous vegetation. Ferns, in many species, are the dominant plants. Occasional patches of tree-ferns (*Cyathea* species) are found but commonly the ferns are not arborescent. With them are found *Heliconia* (a banana relative), an *Anthurium* (the "tailflower" of northern florist shops), a *Lycopodium* ("ground-pine" in the States), a *Carludovica,* or Panama-hat plant (which is sometimes a climber, sometimes trailing), and many lovely species of *Begonia* and other flowering herbs. Tree trunks and branches are thickly covered with moss and small climbers.

For the study of vegetation undoubtedly the Soufrière of St. Vincent is the most interesting locality. Before the last eruption in 1902, accounts related that the mountain was forested right to its summit. During the eruption all plant cover was destroyed by an incandescent avalanche and

the remains were buried beneath a layer of volcanic ash. To this day one unearths logs turned to charcoal from beneath the cinders. As soon as the volcano quieted and cooled, plant colonisation began. Cultivations have now been re-established up to about 1,200 feet on the mountain—up to the point, in fact, where it begins to slope steeply. Immediately above the cultivated area one enters a tall secondary forest 50 to 90 feet in height —tall on slopes, lower on ridges.

The trees do not exceed a foot thick and look thin and drawn up. The canopy is a thin one as the trees have light foliage. Very few species are present, notably *Trema Lamarckiana, Inga ingoides, Cecropia peltata, Ficus* species, *Ochroma pyramidale* (a relative of balsa) and *Daphnopsis caribaea.* These are the trees which associate with *Euterpe globosa* in the hurricane forest, though the palm is not present here perhaps because of insufficient altitude. The forest has an understorey, continuous in places and up to 20 feet high, formed largely of the tree-fern *Cyathea arborea* with many melastomes, pipers, and psychotrias and the solanaceous tree, *Acnistus arborescens.* The herbaceous ground layer is very luxuriant and dense, rather as in hurricane forest. Ferns predominate, heliconias are abundant, and again there are begonias, lycopodium, and anthurium. The lower parts of tree trunks are mossy and bromeliads are plentiful.

At 1,850 feet elevation this forest has lowered to 30 feet high and become irregular, whole patches being covered by *Cyathea* or the trailing silver-fern *Gleichenia.* A very few specimens of *Eutcrpe globosa* appear here, and in the silver-fern patches one finds the conspicuous shrub *Charianthus coccineus* with its brilliant red, bell-shaped corolla.

At 2,000 feet the forest has shrunk to 12 feet high and is gnarled and windswept. *Charianthus* is now dominant, in association with *Trema Inga* and a number of melastomes. The tree line is passed at about 2,200 feet. Here silver-fern is dominant with scattered charianthus shrubs about six feet high and tree-ferns up to eight feet. A lobelia appears here. At 2,400 feet growth is knee-high only, still composed of silver-fern with now very stunted charianthus and cyathea, a pitcairnia, lobelia, ferns and grasses, and the yellow-flowered *Calolisianthus frigidus,* of the Gentian family. At 2,700 feet charianthus and silver-fern begin to thin out and the "tree" ferns are only two feet high.

Towards 3,000 feet the dwarfed vegetation is a blue-green colour and looks distinctly alpine. The ground is entirely and thickly covered with lichens—thallose, foliose and crustose. The scattered higher plants, which are mostly tufted in form, include the lobelia and pitcairnia, Calolisianthus, several grasses, a lycopodium, and a few ferns. The general vegetal covering is ankle-high only. Right up by the crater rim, where a chill wind whistles strongly, the stony ground is thickly covered with lichens and there is little else that will grow. The lichens vary greatly in colour, but

are predominantly grey or orange, which is most striking at a distance. The great crater itself, a mile across and with sheer sides 1,000 feet deep, holds a lake of dark green water at its bottom, on which float crystals of sulphur. Steep as the cliffs are, they are yet covered with plant growth, chiefly a little composite shrub, *Baccharis cotinifolia,* with gleichenia and other low-growing ferns, lycopodium, grasses and a few cyathea tree-ferns.

Perfume from the Flowers of the Coffee Tree

*By Noemí G. Arrillaga**

ONE of the most expensive raw materials of perfume manufacture is the concentrated essence, known as "absolute," of certain flowers such as jasmine (*Jasminum*) and cassie (*Acacia*). Such concentrates are now exceedingly rare under war conditions because of the closing of regular trade channels. The possibility of developing new absolutes was investigated and of those tried, that of the flowers of the coffee tree (*Coffea arabica*) showed the most promise.

Guiscafré Arrillaga and Gómez [1] showed that of the total number of flowers set by the coffee tree only a fraction fruited. Atherton Lee, former director of this station, noting this excess production and the delicate aroma of the flowers, suggested the possible use of this flower as a source of an absolute.

Subsequent work [2, 3] showed the infeasibility of steam distillation of the flowers as well as the poor yields by extraction with lard (enfleurage) and by maceration with mineral oil. The best method of extraction so far obtained has been by solvents to obtain a total extract technically known as a "concrete," which can be purified with alcohol to give an absolute. Petroleum ether was found to give the highest yield, while ethyl ether gave a lower yield but a higher quality product.

An interesting comparison was made of the absolute obtained from the Puerto Rican coffee trees that have run wild with that from the cultivated species, *Coffea robusta.* Flowers from the cultivated plants outyielded the "native" *C. arabica;* however, the latter gave a more agreeable absolute.

---

* Mrs. Arrillaga is on the staff of the Puerto Rico Experiment Station of the United States Department of Agriculture at Mayagüez, P. R.

1 Guiscafré Arrillaga, Jaime, and Gómez, Luis A. Coffee investigations. Puerto Rico Expt. Sta., U. S. Dept. Agri., Rpt. **1938**: 34-37, illus. 1939. (See pp. 35, 36.)

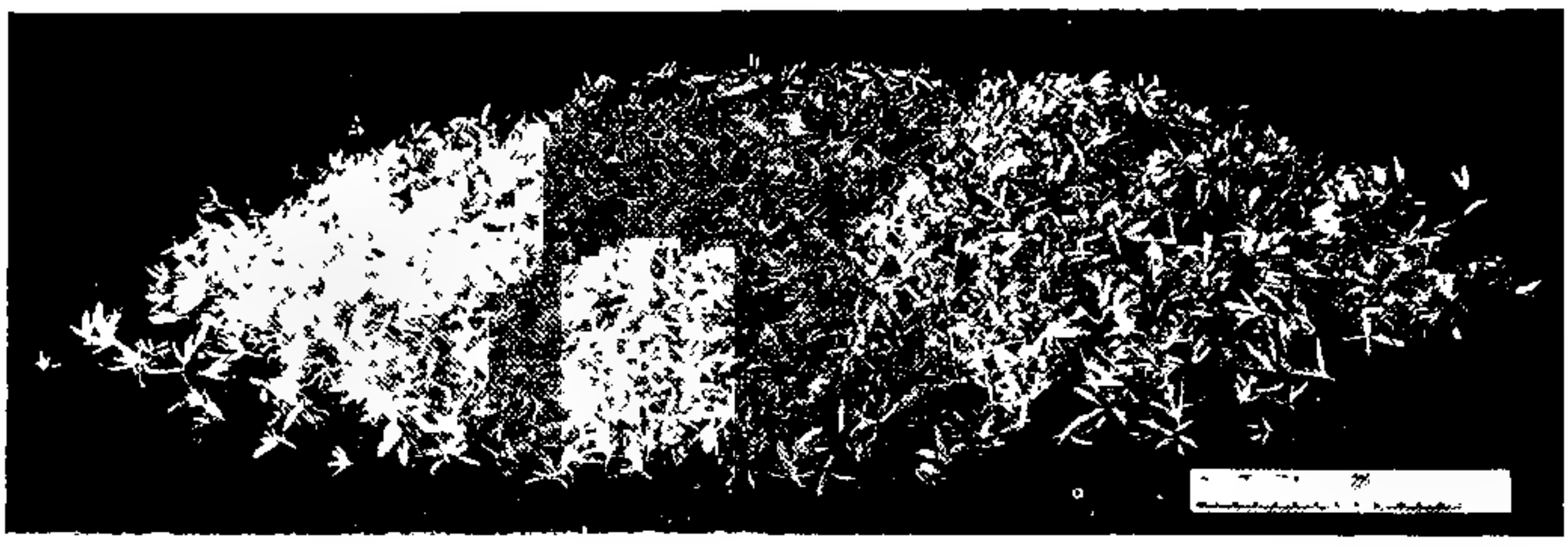
2 Arrillaga. Noemí G. A new perfume oil from coffee flowers. Rev. de Agr. de Puerto Rico **34**: 82-84. 1942.

3 Arrillaga, Noemí G. Absolute from coffee flowers. Amer. Pharm. Assoc. Jour., Sci. Ed., **32(3)**: 77-79, illus. 1943.

Trees of Coffea arabica in bloom at the Puerto Rico Experiment Station of the U. S. Department of Agriculture

In an attempt to increase the yield of absolute, it was found that pressure and desiccation treatments lowered, while freezing increased, the yield, although the increase was only very slight. The freezing treatment has an additional advantage as a method of storing flowers until such time as convenient for extraction.

The absolute has an agreeable aromatic perfume remindful of the bouquet of jasmine, cassie, and mimosa. Many essential-oil dealers who have examined the product have expressed considerable interest and enthusiasm over its possibilities.



Five pounds of coffee blossoms cleaned ready for extraction of the absolute.

*Vegetable Dyes of Ancient Usage**

By William F. Leggett

I. *Saffron for Yellow*

SAFFRON, the principal yellow dyestuff of the Greeks and Romans, was obtained from the stigmas of an autumn-flowering crocus, *Crocus sativus*. Superficially, it resembles the crocus of spring, but is largely distinguished by the long, tapering, three-parted, red stigma which gives a strong dye.

Since more than 4,000 dried stigmas are required to produce a single ounce of dye, the use of saffron declined as soon as other vegetable dyes of comparable quality appeared. However, saffron was long cultivated in Persia, and from there by means of the nomadic Mongols, it found its way into China. In Asia Minor, saffron not only grew wild but was also crudely cultivated in those areas which were carpet-weaving centers. There is evidence that saffron was cultivated in Spain quite early during the Arab occupation, but its introduction into northern Europe is credited to returning Crusaders.

The name of the plant is derived from the Arabic word ZA'FARAN.

Every place where saffron was anciently introduced, it found important uses not only as a dye, but also as a flavoring (for which it still is used), and as an ingredient in medical prescriptions. It found its way into Roman baths to perfume the air, and a contemporaneous record states that "the streets of Rome were strewn with saffron whenever the Emperor returned to the city with his army." Homer frequently refers to it in his writings. At one time in the early days of Greece it was the official color, and Grecian women were particularly fond of saffron yellow for their clothes. The Egyptians also were well acquainted with it.

In the Middle Ages this versatile plant was one of the chief trade commodities, for medieval cooks and physicians as well as dyers used the fine powder of the dried crocus stigmas, and monks discovered that by combining it with an iron mordant, illuminated manuscripts could, quite inexpensively, be made to resemble gold. For a short period, the city of Florence used the saffron blossom on its corporate coat of arms, and at the town of Semifonte, which was destroyed by the Florentines in 1202 A. D., it was commonplace to raise badly needed funds by pledging a few pounds of saffron bulbs rather than jewels or other personal property.

The city of Basle, Switzerland, also adopted the saffron blossom as part of its coat of arms, for this plant long proved a source of wealth for this Swiss community. There was a standing order from local merchants at

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* This is the first of a series of short articles supplementing the longer papers on the principal dyes of early days—madder, indigo, and woad—that have appeared under Mr. Leggett's signature in this Journal.

The saffron crocus, from a plate in Daniel Wagner's Pharmaceutisch-Medicinisch Pflanzen Atlas, puplished in Vienna in 1828. The three long segments of the stigma, from which the dye and flavoring are obtained, are lying against the petals of the open flower, while the three stamens are standing erect in the center. The stigma is red, the stamens yellow, and the flower is purple with fine dark veins.

the custom house of Basle, and consignments of saffron arriving from Italy were eagerly purchased. The "Saffron War" of 1374 A. D. focused attention on the importance of this herb, when a consignment of 800 pounds of saffron was seized as booty. This and similar events, as well as the uncertainty and expense of medieval transportation, induced the merchants of Basle to attempt the cultivation of saffron in their own city. Thus by 1420 A. D., and for ten years thereafter, the cultivation and sale of saffron had become a profitable venture. The City Council proclaimed: "A course of events has arisen which should be a profitable venture for the merchants of Basle, namely the fact that many people, noble and common, have now begun to grow saffron which appears to be coming on well." In addition, the bailiffs of the city were ordered to "keep watch on our fields." The success of this saffron venture at Basle induced other cities to make similar efforts, for "they envied Basle merchants-growers, the City Council, and even the Dean and Chapter of the Basle cathedral who received tithes of every fruit borne by the earth." Many offers to buy saffron corms were declined, and strict local laws were enacted to prevent their export. This highly promising industry was of short duration, however; for a succession of poor crops ended the sale of local saffron scarcely ten years after its start. Nevertheless, Basle remained an important center of saffron activities throughout Flanders, England, and Germany.

A romantic story about saffron is told by the English geographer, Richard Hakluyt, in his "Voyages and Discoveries of the English Nation," in the 16th century. He states that saffron was first brought to England from Tripoli during the reign of Edward III, by a pilgrim who "proposing to do good for his country, hid two saffron corms in his staff, made hollow for that purpose, all this at some danger to his safety, for had he been apprehended he had died of the fact." This story may have been true, for although Hakluyt was capable of romancing, saffron was not native to England and is reputed to have been cultivated there as early as the 14th century by farmers who, until about 1768, were thereby called crokers.

Recent Deaths Among Botanists

Frère Marie-Victorin

AN AUTOMOBILE ACCIDENT July 15 near St. Hyacinthe, Quebec, resulted in the death of Frère Marie-Victorin, Professor of Botany at the University of Montreal, Director of the Botanical Institute there and also Director of the Montreal Botanical Garden. He was returning from a botanical field trip.

Authority on the flora of Quebec and the West Indies, Professor Victorin was

also an influential factor in the promotion of botanical science and in the public's enjoyment of plant life. The establishment of the Botanical Garden in Montreal in 1936 was largely due to his inspiration and efforts, and it was at his request that Henry Teuscher, then a member of the staff of the New York Botanical Garden, went to Montreal to direct the building up of the new institution.

Professor Victorin had made numerous visits to the New York Botanical Garden, one of his latest being June 14 and 15, 1943, when he attended Rose-Growers' Day before leaving for Montreal. He was then on his way back from a trip to Cuba, where he had been studying the flora for several months. Out of a series of trips beginning in 1939 came in 1942 a comprehensive report on the plant life of the island, "Itinéraires Botaniques dans l'Ile de Cuba," a pleasantly written book of nearly 500 pages, prepared in collaboration with Brother Léon of Cuba, and published as Contribution No. 41 of the Botanical Institute of the University of Montreal. A second itinerary appeared about ten days before his death; a third was nearly ready for printing, and a fourth was already begun.

Many honors were bestowed upon Frère Marie-Victorin for both his scientific and his popular writing: in 1928 the Prix d'Action Intellectuelle was awarded to him twice; the David prize in 1923 and again in 1931, the first for his "Les Filicinées de Québec," the second for his "Contributions du Laboratoire Botanique de l'Université de Montréal;" in 1932 the Société Botanique de France awarded him the Gandoger prize, and in 1935, l'Académie des Sciences de Paris the Coincy prize for his botanical work. In 1935 also he was decorated by the King of England and in 1936 was given a gold medal by the Société Provancher d'Histoire Naturelle for his "Flore Laurentienne," an illustrated guide of more than 900 pages.

So far-reaching were his efforts to make the natural sciences understood and appreciated by both young and old, that in 1942 a sizable book by Louis-Philippe Audet was devoted to his pedagogical ideas. In this Frère Marie-Victorin is quoted as saying:

"Education, it is well known, consists in large part of discovering the intellectual and moral resources of individuals and in providing a situation favorable for the development of these resources, which, it must be said, most often remain in the larval state."

Also:

"I have sometimes thought that if we could succeed in placing the child before nature, and if we could lead him to ask this question: 'What does that mean?' we would have transformed the school and resolved a great pedagogical problem . . The school system is a bit anemic . . The cause of this anemia—one of the causes, at least—does it not reside in the undeniable fact that the school is too far removed from nature, and that it has become too exclusively bookish?"

A bibliography of the work of this Christian Brother, covering the years from 1908, contains some 300 titles, of which more than two-thirds are papers, booklets, and books in popular style, the remainder being scientific papers, mainly on phytogeography, systematics, and ecology. He wrote freely both in French and in English, and much of his work was published by the University of Montreal, the Royal Society of Canada, *Le Naturaliste Canadien*, and *The Ottawa Naturalist*.

Frère Marie-Victorin was born at Kingsey Falls, Quebec, April 3, 1865, as Joseph-Louis-Conrad Kirouac. Educated first at the Commercial Academy of Quebec, then undertaking his novitiate with the Christian Brothers of Maisonneuve, on the present site of the Montreal Botanical Garden, he was awarded a Doctor of Science degree by the University the year that he was appointed Professor of Botany there. A member of the leading botanical and other scientific societies in Canada, the United States, England, and France, he was President of the Association Canadienne-Française pour l'Avancement des Sciences in 1937-38. He was also Canadian secretary for the botanical section of the American Association for the Advancement of Science.

A. A. Heller

A CAREER in botany which began in 1892, when he became a field agent for the United States Department of Agriculture upon his graduation from Franklin and Marshall College, came to an end May 18 with the death of Amos Arthur Heller of Chico, Calif. At college he was a classmate of John K. Small, who was Curator at the Botanical Garden for forty years, and the two young men developed their interests in botany simultaneously as they collected plants together in eastern Pennsylvania.

From 1917 until his retirement, Dr. Heller was an instructor at the Chico

high school. Previously he had taught botany at Nevada and Minnesota Universities. In 1898-99 he was in charge of the New York Botanical Garden's Vanderbilt expedition to Puerto Rico.

An avid collector, for many years he sent specimens to the New York Botanical Garden, particularly from the Southwest, and the herbarium now contains several thousand sheets of material that he and his wife gathered on their vacation trips. His chief study was the genus *Lupinus*. At the time of his death Dr. Heller was 77 years old.

A. H. R. Buller

LESS than a month before his 70th birthday, A H. Reginald Buller, Emeritus Professor of Botany at the University of Manitoba in Winnipeg and founder of the department of botany there, succumbed to an illness of several months. His principal work was in mycology, and at various times in recent years he had done extended research at the New York Botanical Garden, working for several weeks at a time in the library and mycological herbarium and laboratory. Much of the preparation for his article on "The Diploid Cell and the Diploidisation Process in Plants and Animals, with Special Reference to the Higher Fungi," published in *The Botanical Review* in 1941, was done at the Botanical Garden.

Notes, News, and Comment

Visitors. Dr. Lulu Gaiser, Professor of Botany at McMaster University, Hamilton, Ontario, and head of the department there, has been consulting the herbarium in connection with work on a monograph on the genus *Liatris*. Other visitors of recent weeks have been Dr. Johannes van Overbeek, plant physioligist from the Institute of Tropical Agriculture, Mayagüez, Puerto Rico; M. H. Berry of Southern Florida College, who has been making some ecological studies this summer at Columbia on the flora of northern Alabama; Carlos Ganzenbach F. of Quito, Ecuador, currently at Cornell University, and Constance Ganzenbach of Tampa, Fla.; Luis René Rivas of Havana, Cuba; C. V. Morton, of the U. S. National Museum; Dr. Clyde Chandler, who is leaving shortly for Guatemala to undertake genetic research in *Cinchona* for Merck & Co.; Henry T. Skinner of Mitchell Field, on leave of absence from the Morris Arboretum; M. Truman Fossum of New York City; Mrs. Jerome W. Coombs of Scarsdale, N. Y.; and Mrs. Mortimer J. Fox of Peekskill, N. Y.

Groups. Students from Adelphi College visited the library and herbarium and the collections of economic plants in the museum on July 15. The same day a group of Girl Scouts from the Bronx made a tour of Range I. On July 19 a group of underprivileged children, under the guidance of the Westside Y.M.C.A. of Mt. Vernon, made a tour of the outdoor and indoor plantings.

Bronson Winthrop. A member of the Corporation of the New York Botanical Garden for more than thirty years, Bronson Winthrop of New York City died July 14.

Volunteers. Judith Embury of New York City and Easthampton, L. I., is a volunteer laboratory technician this summer under Dr. B. O. Dodge.

Grace Antikajian, former volunteer laboratory assistant to Dr. Dodge, has obtained an assistantship at Columbia for a year. She is to work with Prof. J. S. Karling in mycology and cytology. After doing volunteer work at the Garden for some time, Miss Antikajian went to Cornell, then spent a year at the Boyce Thompson Institute.

Air Medal. According to the Monroe (New York) Gazette, Staff Sergeant John M. Uhelski, Jr., who was a gardener at the New York Botanical Garden from September 1941 until April 1942, when he entered the service, has been awarded the Air Medal for "meritorious achievement while participating in bombardment missions over enemy territory." "Staff Sgt. Uhelski has been flying as tail gunner on the Liberator 'Big Bang,'" the paper reported. "He has completed eight missions over Germany and Occupied Europe. On one mission to Hamburg, Germany, his Liberator had one engine shot out by flak."

Books for Russia. Dr. William J. Robbins has been appointed a member of a committee sponsored by Russian War Relief, Inc., to recommend technical books for the Soviet Union. Staff members at the Garden are assisting in preparing lists of books to be submitted to the committee, of which V. K. Zworykin is chairman.

"Presented." Dr. A. B. Stout is the subject this month of the "We Present" column in the *Gardeners' Chronicle of America.* Each month since January 1943, a portrait and brief biography have been given of a leading horticulturist or of a botanist who has been of influence in the horticultural world.

Notices and Reviews of Recent Books

(All publications mentioned here may be consulted in the Library of The New York Botanical Garden or may be purchased on order through the Library.)

Stimulation for Ecologists

FOUNDATIONS OF PLANT GEOGRAPHY. Stanley A. Cain. 556 pages, maps, glossary, literature cited, index. Harper & Brothers, New York, 1944. $5.

The book by Stanley A. Cain, recently released by Harper & Brothers, is one of the most stimulating and most thought-provoking works on plant geography and ecology the reviewer has read in many years. When the author says in the preface that he has "cut the hedgerows" between a large number of sciences, he describes merely the principles he had laid down when the work was begun; in reality he transcends these, for the "hedgerows" are seen only from the deep centers of the fields involved.

One is captivated by the easy flow of terminology representative of the various fields of science, which is possible only if the author need not hesitate to find his way in the labyrinth of basic principles and terms. This reflects wide and careful reading.

The work is panoramic, delightfully so, and shows clearly that plant geography and ecology deal with the living form in its business of living; and impresses one forcefully that the present is merely a chapter in a great story, which can be understood only (imperfectly so) in the light of other chapters. The author's "pep sessions" with many authorities in the various related, some highly technical, fields of science are reflected in the argumentative, at times encyclopedic, manner of presentation of controversial opinions, which automatically draw the reader into the debate.

It is not a book intended to entertain, but rather to stimulate action. The reader will irresistibly take part in the great symposium. By its extensiveness of thought, and by its involving so many fields of sciences, the book will no doubt limit its circle of readers; as a classroom text it would require as prerequisites at least basic courses in the fields involved in the argumentation.

Concise summary statements introduce each of the thirty chapters and prepare the reader for the opinions to be presented.

The introduction sets forth the meaning and scope of plant geography. Part II deals with paleoecology, reviewing the various fields of investigation of fossil flora, especially those of Tertiary and post-Pleistocene times, and discussing the relationship of some present-day vegetation types to the fossil flora of the same region. The author expresses the opinion that the ecological approach is likely to yield the most satisfactory results in solving paleobotanical problems. In Part III, Areography, area is considered in its relationship to migration, distribution, centers of origin of species, and vegetation types. Its effect on endemism and senescence of species are also discussed. Part IV introduces evolution. Five chapters are devoted to the specific problems of the taxonomist, that is, species and speciation. It seems to

the reviewer that the validity of species as expressed in Chapter *22* can be accepted only as a hypothetical goal for the bulk of the plants. If the thesis: "Inability of crossing outside of its group is *the* test of a good species," should form the basis for giving species rank to a plant, the science of taxonomy could operate only with difficulty. Polyploidy receives consideration under Part V. Genetics has given valuable aid in the solution of problems related to plant distribution, and so the plant geographer is almost obligated to consider its contribution to his field of interest.

The glossary offers a source of ready reference to unfamiliar terms, and the bibliography of 720 titles is in itself a valuable source of information on plant life as it interests the geographer and the ecologist.

The co-operation given the author by individuals and institutions is worthy of praise even from disinterested persons. New York Botanical Garden deserves special credit in this respect for having made available to Dr. Cain ideal working conditions near an excellent collection of plants for ready reference, and easy access to library help and facilities.

Whether or not you agree with every argument presented in Dr. Cain's book, you cannot read these enlightening chapters without becoming a better ecologist and plant geographer.

J. E. POTZGER,
Department of Botany,
Butler University, Indianapolis.

Southern Appalachian Panorama

THE GREAT SMOKIES AND THE BLUE RIDGE. Edited by Roderick Peattie. 384 pages, illustrated, indexed. The Vanguard Press. New York, 1943. $3.75.

There seems to be a perverse twist of fate which causes books about the Southern Appalachians to be written too often by outsiders, who, no matter how well versed they are in their field or how absorbed in their subject, never quite present the spirit and life of the people or the appeal of these quiet, substantial mountains. Some sections of the Peattie book are excellent, but others fall far short of their goal.

Alberta Pierson Hannum has written the outstanding part of the present work, sympathetic in its tone and in understanding of the people, but even it is a little tainted by too much accent placed upon certain of their peculiarities. To one born and reared in this region this picture is offending, for these are a kindly and hospitable folk whose peculiarities are no more predominant than they are in the folk of any other section of the country.

The chapter by Arthur Stupka gives so beautifully lucid a picture of a round-season in the Great Smokies that it has a nostalgic effect on a reader familiar with the region.

Ralph Erskine's picture of the climatic conditions throughout the region is excellent. His section on mountain craftsmen, however, is extremely short and incomplete. One wonders what has become, for example, of all the craftsmen who made so many articles of furniture and tourist-trade items of rhododendron and laurel-wood at and after the turn of the century. What also has happened to their almost vanished art of burning pictures of mountain and river, leaf and flower, on wood and leather?

John Jacob Niles led this reviewer tantalizingly into the subject of folk ballad and carol and then left him there, wishing for complete words and tunes, and idly speculating upon how many of the songs *he* learned as a child may have escaped the compilers.

Henry S. Sharp has succeeded admirably in making a fascinating story of the geological history of a highly complex structural area.

The early history of the region has been handled in a readable manner by Donald Culross Peattie, who has made the most of the cruelties of the times. His two chapters on trees and wildflowers, however, while no doubt delightful to one who enjoys his style, contain too little information and too much hackneyed Michaux and other personalities to render them of any real value. Mr. Peattie's other writings show that he can do much better work. One wishes that these two disappointing sections had been omitted and their space occupied by more from Erskine and Niles, whose chapters suffer so much from brevity.

Edward S. Drake does a snappy job on how to plan one's trip—too snappy, indeed, for any but the speeding auto tourist, in whose interest many a mountain, stream, and valley have been ruined by highway planners with no heart for the land. Foot travel is the

only way to truly see this country, but that method has been practically ignored in this book. Those who know and love these mountains will miss Mt. Pisgah, Grandfather, and Roan, the three most spectacular in the section. Also, more attention could have been given to the Sapphire Country around Lake Toxaway and Highlands, whose waterfalls, rocky summits and deep coves are rated high as mountain scenery.

As for illustrations, many better pictures are available of both the scenery and flowers. And why, in the list of illustrations and in the picture opposite page 187, is *Shortia galacifolia* spelled *galaupolia*, when on page 189 it is correctly spelled? As a crowning ignominy, this picture is upside-down.

E. J. ALEXANDER.

Instruction Sans Stylish Dressing

PLANTS AND FLOWERS IN THE HOME. Kenneth Post. 198 pages, illustrated; glossary, index. Orange Judd, New York, 1944. $2.

In a collection of garden books assembled through many years, this writer has several which bear the imprint of the Orange-Judd Publishing Company. They are not models of the printer's art. They have a good many typographical errors, but, if a choice were necessary, many a stylishly dressed book would be sent away before those rather uninteresting-looking ones would be discarded. They are simple, straightforward, and filled with information.

This book is more or less of the same type, with many mistakes, chiefly in spelling. Just the same, there is much simple, practical knowledge here, and a beginner especially would find it helpful.

To mention only a few of the errors: under the photograph on page 104 there are two—*Cissus antartica* for *antarctica* and *Nephthytis libirica* for *liberica*. On page 100, Bromeliads is given as Bromelids, and *Cryptanthus zonatus* as *zinatus* Clivias (page 58) do not come from South America, nor is their cultivation good as given. "Narcissi and tulips grow poorly if forced before the 15th of January." What about paperwhites and Soleil d'Or? On the same page 53, we read, "Hyacinths and narcissi can be forced in pebbles or glasses of water [in November]," and on page 73: "Obtain large bulbs [of paperwhites] during September or October and plant them" or "Place them in a sunny window immediately." The confusion, of course, is between the tazettas and the later King Alfred type, but how would a novice know?

Even in view of such a lack of accuracy and clear explanation, this writer still thinks there is much that is good in this book.

SARAH V. COOMBS.

Radio Gardener's Volume

THE OLD DIRT DOBBER'S GARDEN BOOK. Thomas A. Williams. 2nd edition. 309 pages, illustrated, indexed. Robert M. McBride & Co., New York. 1944. $2.75.

In this new edition the section on vegetable gardening has been enlarged by nearly 60 pages which contain directions for the culture of specific crops. It is a useful addition, keyed to the times. One wishes that more specific information were given in other parts of the book, to avoid such generalities as: "A safe rule to follow [about the pruning of flowering shrubs] is to do all the necessary pruning immediately after the blooming season." True enough for many shrubs, but disappointments will follow if hybrid tea roses, hydrangeas, and buddleias are pruned immediately after they have flowered.

A needed correction has been made in one of the captions, but plenty of other faults were not overcome. *When* will there be a book (or a popular magazine) produced in which the author provides his own carefully typewritten information for the pictures, instead of the publisher's assigning some incompetent person to decipher and elaborate upon the author's scribbled notes? If a reliable writer were given half a chance, we would not have such absurd space-filling lines as this one beneath a picture of a nasturtium: "The dwarf species in this picture is tropaeolum." There are others quite as ridiculous, and they mar a book whose text contains some otherwise useful information for beginners. The author has for several years had a weekly program on the radio.

CAROL H. WOODWARD.

For Victory Gardeners

Free and low-cost manuals to help the home gardener solve his many problems

in the back-yard vegetable plot continue to appear. Some gleanings from this year's crop are mentioned below.

Practical and Humorous

LET'S ALL GROW VEGETABLES. Grace Keen and Arthur Hutchins. 92 pages, illustrated, indexed. University of Minnesota Press, Minneapolis. 1944. $1.

An irresistible book—attractive in style and particularly in the clever drawings by Grace Keen; also thoroughly practical in its directions for growing and caring for forty-some crops and keeping them free from diseases and pests. An encouraging chapter is the one devoted to a real-life story of a 9 x 12 area—the size of a parlor rug—which provided more than 500 servings of vegetables during the season.

Instructions from Cornell

VICTORY GARDENING. Arthur J. Pratt, W. E. Blauvelt, A. W. Dimock. 77 pages, illustrated. Published by New York State College of Agriculture at Cornell University, Bulletin 631, Ithaca, N. Y. 1944. Free.

An excellent guide, illustrated partly in color and apparently covering every sort of question that the beginning gardener might ask: where to have a garden, how to prepare and plan it, what kind and how much seed to buy for a desired yield of each vegetable, what to do about the eternal problems of cultivating, watering, fertilizing, and keeping the garden clean and healthy. Besides the cultural directions for specific crops, there are plenty of photographs, drawings, and tables to illustrate and supplement the text.

The Latest on Insecticides

CONTROLLING PESTS OF WAR GARDENS. Neely Turner & James G. Horsfall. 63 pages, illustrated, indexed Connecticut Agricultural Experiment Station, Circular 159. New Haven. 1944. Free.

A revision of a useful booklet of last year, with the list of available insecticides brought up to date.

Chicago Report

GARDENING FOR VICTORY. 56 pages National Victory Garden Institute. New York City. 1944. 10 cents.

A digest of the proceedings of the National Victory Garden Conference held in Chicago in November 1943, résumés being given of the remarks of nearly 30 speakers who presented a program aimed to inspire the cultivation of 22,000,000 victory gardens in 1944.

Group Gardens

MANUAL FOR COMPANY-EMPLOYEE GARDENS. 38 pages, illustrated. National Victory Garden Institute. New York City. 1944.

Suggestions for the management of company, community, railroad right-of-way, and other types of gardens that can be sponsored by large organizations for their employees.

Contestants' Records

GREEN THUMB CONTEST RECORD BOOK (Junior and Senior editions for Victory Garden Contest). National Victory Garden Institute, New York City. 1944.

Gardeners—either juniors or adults—who wish to enter the contest for which war-bond prizes are offered by the National Victory Garden Institute may, for a small fee, obtain these record books for keeping track of their crops from the general field office, 188 West Randolph St., Chicago, or from the institute's headquarters at 598 Madison Ave., New York 22.

Picture-Guide to Wild Flowers

HOW TO KNOW THE SPRING FLOWERS. Mabel Jaques Cuthbert. 168 pages, illustrated, indexed. H. E. Jaques, Mt. Pleasant, Iowa. 1943. Spiral binding $1.50. Cloth binding $2.50.

The entire text of this book is an illustrated key to the spring flowers of the United States and southern Canada. The alternative choices in the key are illustrated if necessary and each species, when it finally appears, is briefly described and completely illustrated with a habit sketch and details of diagnostic features. It is unfortunate that although the magnification or reduction of the habit sketch is given, there is no indication of the magnifications of the enlarged parts of flowers and fruits. The introductory section, giving the amateur layman or juvenile student a brief summary of "plant parts and what they do," is illustrated. The index is also a pictured glossary.

FRANCES E. WYNNE.

Acres, For What?

NATURAL PRINCIPLES OF LAND USE. Edward H. Graham. 274 pages, illustrated, indexed. Oxford University Press, New York. 1944. $3.50.

This would be a particularly good book for the city-bred individual to take along as non-fiction reading on his vacation in the country—any part of the country. Those living in the country or engaged in rural occupations will also find it informative.

Natural principles of land use would appear to be a longer way of saying ecology, and this book is mostly ecology. Ecologists should read it with considerable reflection for the greatest criticism of it is one common to ecologists and textbooks of ecology: when one finishes this book he may still be wondering what are the natural principles of land use. Likewise one hears of ecological principles but seldom sees them enumerated, defined, or clothed in flesh of specific illustration or instruction. Perhaps the purpose of the book is to launch a new profession — that of land-management technician. There is a section headed, "The Land-management Biologist" and the land-management technician is repeatedly mentioned. His position in society or on the payroll, his authority or responsibility, and his equipment or techniques are not discussed. But the principles with which he should be familiar are, presumably, the basic thesis of the book. . . . "To treat significant natural phenomena that can serve to provide guiding rules of thumb for the land manager is the purpose of this book."

That the book is something of a compilation of direct and indirect quotations cannot be denied. Nor should it be, for the large number of citations is a tribute to the author as well as recognition of those who have pioneered the information. They are generally well integrated so that the theme of the book runs smoothly. One finds particularly impressive statements and is tempted to underscore passages in agreement or as a challenge:

". . . Civilized man, however, is undoubtedly the most powerful biological influence for pronounced change that has ever existed."

". . . We have encouraged to an almost fantastic degree a few short-lived annual crops, some perennial food-producing plants, and a dozen or so kinds of useful animals."

" . . It is conceivable that, at least so far as the larger land forms are concerned, the majority of wild plants and animals may even cease to be, except as living museum pieces in refuges or wilderness areas."

Perhaps the whole book is most aptly summarized in the following: ". . . With due regard to prevailing economic conditions, the use of any parcel of land should result in the yield of that crop which can be most profitably supported without permanent injury to the physical capacity of that land to produce."

JOHN A. SMALL,
Associate Professor of Botany,
New Jersey College for Women.

Natural Dyes of Centuries Past

ANCIENT AND MEDIEVAL DYES. William F Leggett. 116 pp., indexed. Chemical Publishing Co., Brooklyn. 1944. $2.50.

The story of the discovery and use of color, which began with the dawn of civilization and was anciently considered a spiritual necessity of almost equal importance to the physical need of food—dyes which, in the hands of medieval craftsmen, gave to textiles hues of rare beauty -is concisely related in "Ancient and Medieval Dyes." This is the first time that such information has been gathered in a single book. It is the result of extensive research on the part of the author, who for many years has written on dyes and textiles. Much of it has appeared in the Journal of the New York Botanical Garden.

Dyes were among the more important articles of commerce during the Middle Ages and great rivalry developed between nations. Bagdad was the chief center for traffic in dyes for a time and Spain added to her riches by bringing over cochineal from Mexico and by the growth of indigo in the New World thus breaking the monopoly of the Far East. In certain areas of Great Britain and the Continent the growing of madder and of woad became leading industries, and laws were passed to protect the home producers against the encroachment of new and in some cases better dyes. By royal decree the British soldier was dressed in a red coat and King Louis Philippe ordered all French army uniforms to be

"dyed red with madder," both of these decrees being made for the purpose of promoting the use of this red dye. Fascinating legends describe the discovery in ancient times of Tyrian purple and kermes dyeing. Methods of dyeing in many instances were closely guarded secrets.

The reader will discover in this little book an interesting narrative as well as many important facts about the natural dyes, a few of which have survived to modern times.

JULIAN S. JACOBS,
Editor, Textile Research.

400 *Algae of the West Coast*

MARINE ALGAE OF THE MONTEREY PENINSULA. Gilbert Morgan Smith. 622 pages, 98 plates, index, bibliography. Stanford University Press, Palo Alto, California. London: Humphrey Milford, Oxford University Press. 1944. $6.

As the author of *Fresh-Water Algae of the United States* and of *Cryptogamic Botany* (two volumes), Professor Smith has shown himself extremely able and versatile in the selection, assembly, and compilation of material in a botanical field in which works both comprehensive and usable by the student have been notoriously few. In his *Marine Algae of the Monterey Peninsula* he has again made a noteworthy and long-awaited contribution.

For nearly forty years Professors W. A. Setchell and N. L. Gardner, at the University of California, collected and studied the marine algae of the Pacific Coast with the view toward publishing an authoritative account of the species of the entire region. A part of the colossal task was accomplished in the completion of the volumes on the blue-green, the green, and the brown algae. The comprehensive treatment of the red algae became so extensive and time-consuming, however, that these men did not live to accomplish the final assembly of their vast collections of material. Thus, neither specialists nor students of the marine algae have ever had a complete text or reference work on the marine flora of even the California coast, much less of the whole coast of western America.

For his summer courses at Stanford's Hopkins Marine Station, Dr. Smith needed a text on the California algae—so he wrote it himself. It was not his intention that the work should embrace all of the western American algae, nor even all of the California species. He limited his scope to the Monterey Peninsula of California alone, but found there a far richer marine flora than occurs at any other locality along the whole west coast of America. Although limited to a very small geographic area, this book contains descriptions of nearly 400 species, and includes at least 80% of the species occurring at any locality between Puget Sound and southern California.

The book is intended primarily for the student, and provides him with a historical review, directions for collecting, a glossary, and a lengthy bibliography. It contains not only a simplified, usable key to the genera, but many other keys—to classes, orders, families, genera, and species—throughout the text. These, together with the careful and very complete descriptions of all taxonomic groups, will be of great aid and convenience to every student of seaweeds, for Dr. Smith has extracted and compiled information which is otherwise accessible only in scattered publications, many in foreign languages.

To the amateur collector of algae along the California coast, this book will prove a treasure, for in it are excellent drawings of a large majority of the species described in the text. Heretofore, because of the nature of the literature, only those who made a special study of the seaweeds have been enabled to identify the West Coast species. Now, it is possible for any naturalist, whether high school student or retired business man, to name the plants he may collect simply by matching them with their portraits in this book.

Since Smith's is the first reference work of its kind to appear on the Pacific Coast marine algae, it fills a great and long-standing need. It promises not only to serve well its immediate purpose as a guide to the local flora, but also to mark the way clearly for a larger, more extensive and complete account of the western American algae such as was projected by Setchell and Gardner over thirty years ago.

LT. E. YALE DAWSON,
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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

A RARE SUGAR

First in a series of editorials designed to show the unique and specialized services that are furnished to the public without cost by the New York Botanical Garden

IN 1917 a collector in British Columbia sent to the New York Botanical Garden samples of manna (a sweetish, gummy exudation from trees) which he had collected from the Oregon spruce. Dr. Helene Boas (daughter of the late Franz Boas, anthropologist at Columbia University) was at that time a technical assistant at the New York Botanical Garden, and she forwarded samples of this material to Dr. C. S. Hudson, one of the country's outstanding sugar chemists. Dr. Hudson found this manna to consist largely of a rare and unusual sugar called *melezitose*. One of the peculiarities of this sugar is that it crystallizes or solidifies very readily; it is not possible to make a thick syrup from it.

In the summer of 1943 a bee-keeper in Virginia who prepared centrifuged honey—that is, honey extracted from the comb and sold as a clear syrup - reported to Dr. Hudson that his entire crop of honey had crystallized in the comb and was unusable. The summer of 1943 was very dry in Virginia, and the Virginia pine had produced a good deal of honeydew, which is the first step in the formation of manna. Since the bees could not obtain nectar from the flowers, they had collected the honeydew from the pine trees and stored it in their combs. Dr. Hudson purchased 1,500 pounds of the crystallized comb honey from the bee-keeper and from it obtained more than 200 pounds of melezitose.

Of what use is this sugar? No one knows. It represents, however, an addition to those chemical compounds produced by plants for which a use will doubtless be found some time in the future. As the result of this chain of events there is available for experimental purposes a quantity of this sugar, available nowhere else in the world.

The New York Botanical Garden played a part in this discovery; a collector in British Columbia, acquainted with the reputation of this institution, sent the unknown manna to us; a member of our staff, knowing the scientists in other fields, referred it to Dr. Hudson, who isolated and identified its unusual constituent. Now, after more than twenty-five years, a quantity of this sugar adequate for further investigation by qualified scientists is available.

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JOURNAL

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THE NEW YORK BOTANICAL GARDEN

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Bacterial Leaf Nodules

By Harold J. Humm
Duke University

An Approach to a Little Known Phenomenon in Plant Structure

OF all bacterial symbioses known to science, one of the most neglected and least understood is that of bacterial nodules in the leaves of certain tropical shrubs. Over 370 species of plants, which fall into five genera and two families,[1] are now known to have leaf nodules formed by bacteria which have never been found outside the tissues of these plants. The life of every individual plant of all these species seems to depend upon the bacteria which live symbiotically in all the leaves.

Leaf nodules are typically small elevations of less than two mm. in diameter. They may be irregularly scattered over the surface of the leaf, located along the leaf margin only, or present as two rows along each side of the midrib.[2] They are prominently raised on the upper surface but only slightly beneath.

In the family Rubiaceae, 294 species of the genus *Pavetta* and 42 species of the genus *Psychotria,* without exception, have been reported to have leaf nodules; in the family Myrsinaceae they have been found in 30 species of the genus *Ardisia,* in five species of the small genera *Amblyanthus* and *Amblyanthopsis,* and in other genera. Leaf nodules are thus of taxonomic significance in all species in which they occur. At the same time, all these genera include species which never have leaf nodules as, for example, the two or more species of *Psychotria* native to southeast Florida. A single species of the genus *Dioscorea* (Dioscoreaceae) is said to have symbiotic

[1] An investigation made in the herbarium of the New York Botanical Garden by Joseph Monachino has revealed pustules resembling the bacterial nodules described here on the leaves of *Laguncularia racemosa* in the Combretaceae and on some species of *Souroubea, Ruyschia, Norantea,* and *Marcgravia* in the Marcgraviaceae, but so far as is known, no studies have yet been made of these.—C.H.W.

[2] Only in the section Graptophyllum of the genus *Pavetta,* according to Bremekamp (Rep. Spec. Nov. **37**:15. 1934) do the bacterial nodules occur in a different formation; there they follow the ramifications of the smaller veins and thus branch irregularly.

bacteria in glands located in attenuated leaf tips. These, however, seem to be different both morphologically and physiologically and are not true leaf nodules.

Long before any investigations were undertaken of the nature of leaf nodules, legume root nodules had received much attention and their symbiotic nitrogen-fixation role was known. Consequently, many research workers who have considered leaf nodules have attempted either to prove the assumption that they represent another example of symbiotic nitrogen fixation, or else have been influenced in their work by such a preconceived belief. The result is that much of the literature on this subject is of limited value and, in the opinion of the writer, the true nature of this interesting symbiosis is still not known.

Among the none-too-numerous papers on the subject, the writer considers only a few [3] to be of importance, and one of these (Zimmermann, 1902) is purely morphological. A paper by Bremekamp (1933) which lists the bacteriophilous species of *Psychotria* and another, by the same author (1934), in which he has monographed the genus *Pavetta*, are of additional value. All other papers encountered seem to be of minor importance in so far as a study of this symbiosis is concerned.

The bacteria which give rise to leaf nodules are not limited to the interior of nodules. They are found also as thin, gummy layers between leaf primordia of all vegetative and floral buds of the plant. As new leaves develop and stomata are formed, some of the bacteria from these primordial reservoirs penetrate embryonic leaves through the stomata before the leaves unfold from the bud. These bacteria soon fill up intercellular spaces adjacent to the stoma through which entrance was made. This enlarging bacterial mass forces parenchyma cells apart and, through pressure, forms a sheath of closely-packed plant parenchyma cells that limit their further expansion. Von Faber (1914) believes that a few parenchyma cells of the host plant are killed through isolation when the nodule is formed.

As with vegetative buds, bacteria are present among embryonic flower parts and it is believed that they enter the ovary, penetrate the ovules, and finally gain entrance to the embryo sac. As the seed develops, a thin layer of bacteria comes to lie between the embryo and endosperm. In the course of this movement through plant tissue, it is believed that the bacteria are always confined to intercellular spaces and do not destroy cells of the host plant. It has been suggested that entrance of bacteria to the embryo sac may be aided, in some species, by penetration of the pollen tube.

When a seed germinates, some of the bacteria within gain entrance to the epicotyl and in this way the association of plant and bacteria is maintained. Infection of plants from outside apparently does not occur, hence the symbiosis has been termed "hereditary" or "cyclic."

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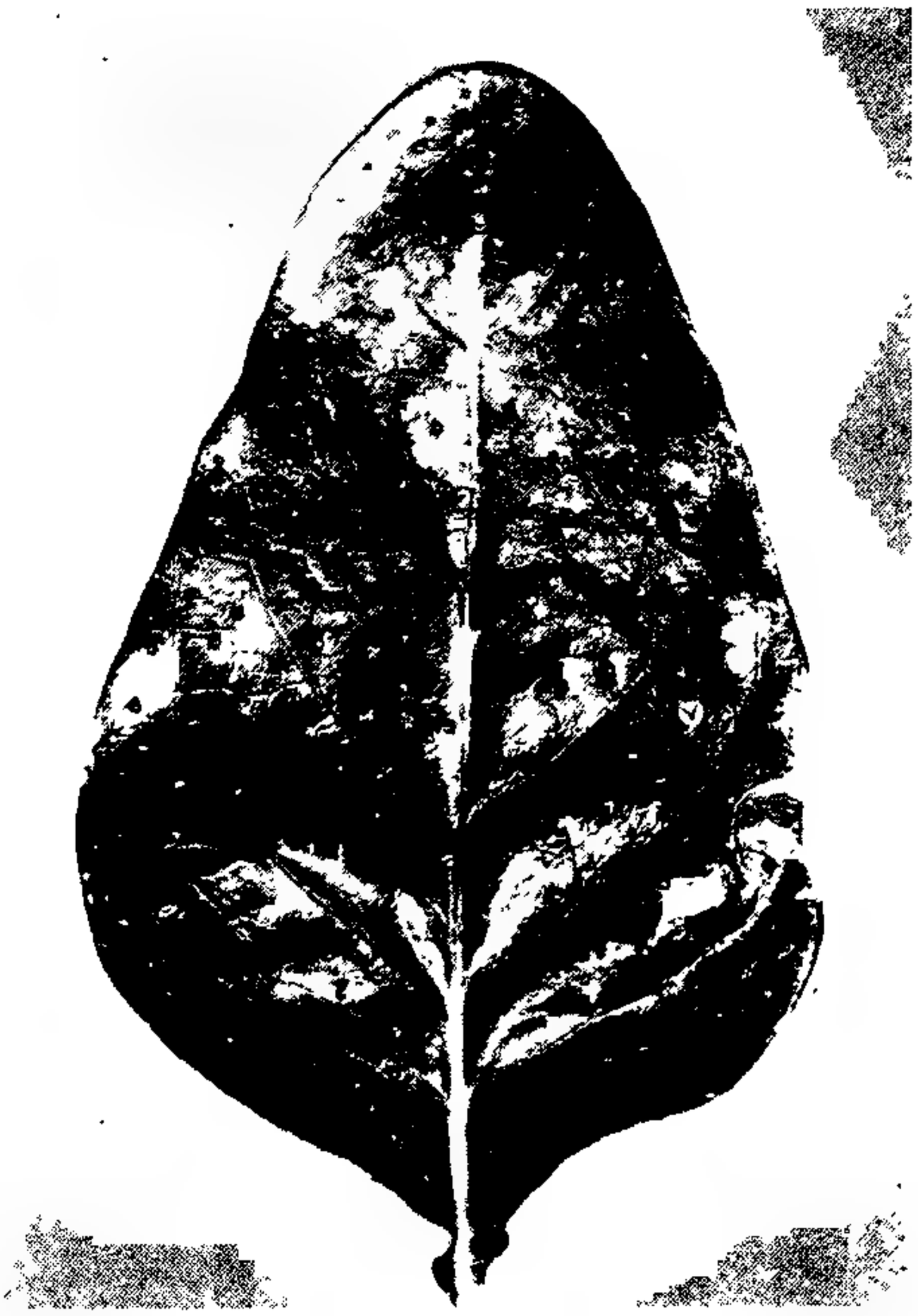
[3] See the end of this paper for a list of the selected references.



A mature leaf of Psychotria punctata, natural size, showing the bacterial nodules.

Since the presence of symbiotic bacteria in seeds depends upon their chance penetration of the ovule from among flower bud primordia, some seeds might be expected that lack bacteria. Apparently this does occur in all species so far studied. Such seeds germinate normally and produce seedlings that are apparently normal until the first true leaves develop. (Cotyledons lack nodules even in bacteria-possessing plants.) The first pair of true leaves of bacteria-free plants may look normal except for the absence of nodules, but the few subsequent leaves that appear become distorted in shape and much wrinkled. Leaf development soon ceases entirely, the terminal bud stops normal growth and, especially in the genus *Ardisia,* becomes necrotic. Numerous adventitious buds may be formed over its surface but these never form leaves. Such plants have been termed "cripples." They rarely exceed two or three inches in height and

Two seedlings of Psychotria punctata, natural size, about 3½ months old. The plant on the left is bacteria-free and has reached its maximum development. The one on the right is normal—that is, every leaf is dotted with bacterial nodules.

they die without further growth, regardless of the care they may be given. Seedlings possessing bacteria develop nodules in all leaves that appear subsequent to cotyledons. These are normal plants.

In *Ardisia,* nodules occur in leaf margins only, and they appear when the leaves are developing. They arise by bacterial penetration of hydathodes (epidermal structures through which water is given off), rather than through the stomata. Otherwise, the morphological story of nodules in this genus is similar to that in *Psychotria* and *Pavetta.*

Psychotria punctata Vatke (*P. bacteriophila* Val.) was introduced into southern Florida by Dr. David Fairchild, pioneer in the Bureau of Plant Industry, widely known for his plant exploration and introduction work and for his writings on this subject. Dr. Fairchild's original plant, which has grown to a height and diameter of six feet on his estate in Coconut Grove, Fla., was the source of several hundred seeds used by the writer. Of 330 of these seeds which germinated in the Duke University greenhouse in the spring of 1942, 28 percent produced bacteria-free plants. Two of these plants of the same age, one bacteria-free and one normal, are shown above. Normal plants from these seeds developed from 100 to 150 nodules per leaf on full-sized leaves. All bacteria-free plants became "cripples" and died within 18 months with the exception of one which produced a shoot from a bud in the axil of a cotyledon. This branch possessed bacteria and developed into a normal plant.

Seedlings that produced leaf nodules grew poorly in a nitrogen-deficient substratum. Those lacking nodules, on the other hand, did not respond any more readily when nitrates were applied than did normal plants. If this curious symbiosis were one in which the only benefit to the host plant were fixed nitrogen, as some investigators believed, it is unlikely that bacteria-free plants would develop into distorted dwarfs which ultimately die, regardless of the nitrate content of the soil. Rather, they would behave in a manner typical of plants suffering from nitrogen deficiency and would respond to optimum soil nitrates. To attribute these characteristically crippled plants to nitrogen deficiency infers that ordinarily available soil nitrates cannot be utilized by bacteria-free plants. Such a conclusion is untenable. The most acceptable suggestion yet encountered by the writer to explain the relation of leaf nodule bacteria to the host plant is that proposed by Miehe (1916), who assumes a stimulative effect—"Reizwirkung." Possibly a hormone is produced by these bacteria upon which so-called bacteriophilous plants, in the course of their evolution, have become totally dependent.

Although several investigators have isolated bacteria, which they regarded as true nodule-forming organisms, from leaf nodules, seeds, and stem tips, the writer is not fully convinced that anyone has as yet grown the true bacterial symbionts in culture. There is disagreement among workers as to the characteristics of their cultures and, although one or two claim to have inoculated bacteria-free plants from cultures and obtained nodules in subsequent leaves, the evidence is not entirely convincing. As with the example of the *Psychotria* seedling mentioned above, bacteria-free plants sometimes give rise to a branch that develops nodular leaves quite spontaneously.

Several important differences between leaf nodule and root nodule symbioses are apparent:

First, legumes receive their bacteria from the soil; leaf nodule plants are normally not inoculated from without, but receive their bacteria from the parent plant by way of the seed.

Second, legume plants grown in the absence of root nodule bacteria exhibit nitrogen deficiency only; whereas, bacteria-free leaf nodule plants —at least in the genus *Psychotria*—are "crippled" and usually die before reaching more than three inches in height.

Third, root nodule bacteria penetrate and live inside cells of the host plant; leaf nodule bacteria live in intercellular spaces only.

Fourth, legume bacteria are readily cultured from nodules; leaf nodule bacteria, according to some investigators, cannot be isolated from nodules but must be obtained from stem tips or from inside seeds.

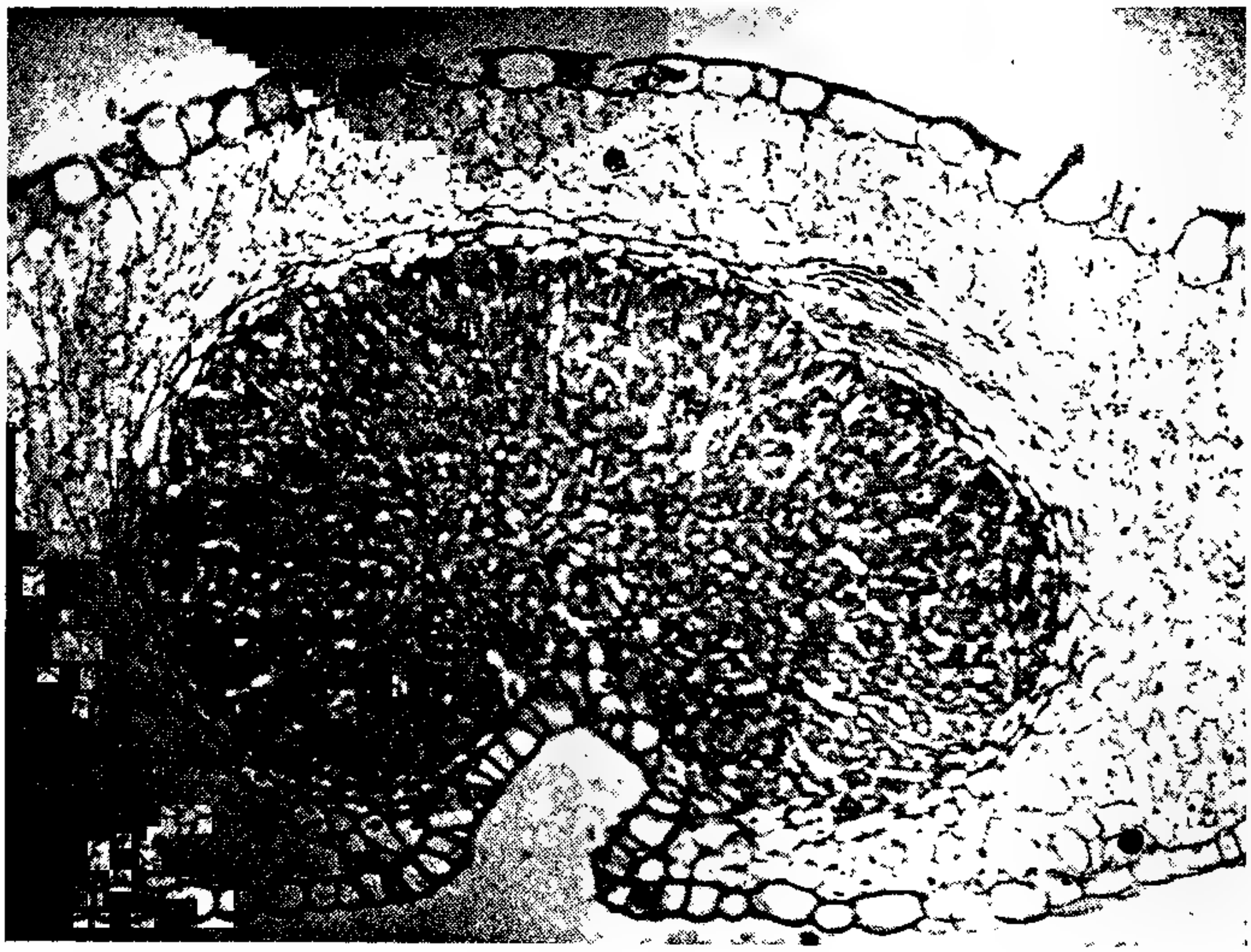
Fifth, root nodule bacteria have been proved to fix nitrogen within the host plant; evidence that leaf nodule bacteria do so is questionable and is, in fact, doubted by some workers (Miehe, 1916. de Jongh, 1938).

Sixth, a single species of bacteria occupies root nodules; there is good evidence that in addition to the bacteria which form leaf nodules, one or more other species may be present as "companions."

It has been reported that the Tamil cultivators of Ceylon use leaves of *Pavetta indica,* a bacteriophilous species, for green manure. Although leaves of this species may be of value as such, it is doubtful if the presence of leaf nodules contributes to this value in any way. Possibly the natives of Ceylon were so advised by someone who, on the basis of knowledge of nitrogen fixation in legume root nodules, drew an unjustifiable analogy. The recommendation that *Psychotria* plants be grown as an understory on coffee plantations has also been made without adequate experimental evidence in favor of their assumed value.

The problem of bacterial leaf nodules in tropical shrubs offers a challenge to agricultural bacteriologists. Young plants of bacteriophilous species of at least two genera [4] are often found listed in Florida nursery catalogues. They can be grown easily and will produce seeds in any greenhouse that is well-heated during winter.

[4] *Ardisia* and *Pavetta.*



Microscopic cross-section of a leaf of Psychotria punctata made through a bacterial nodule.

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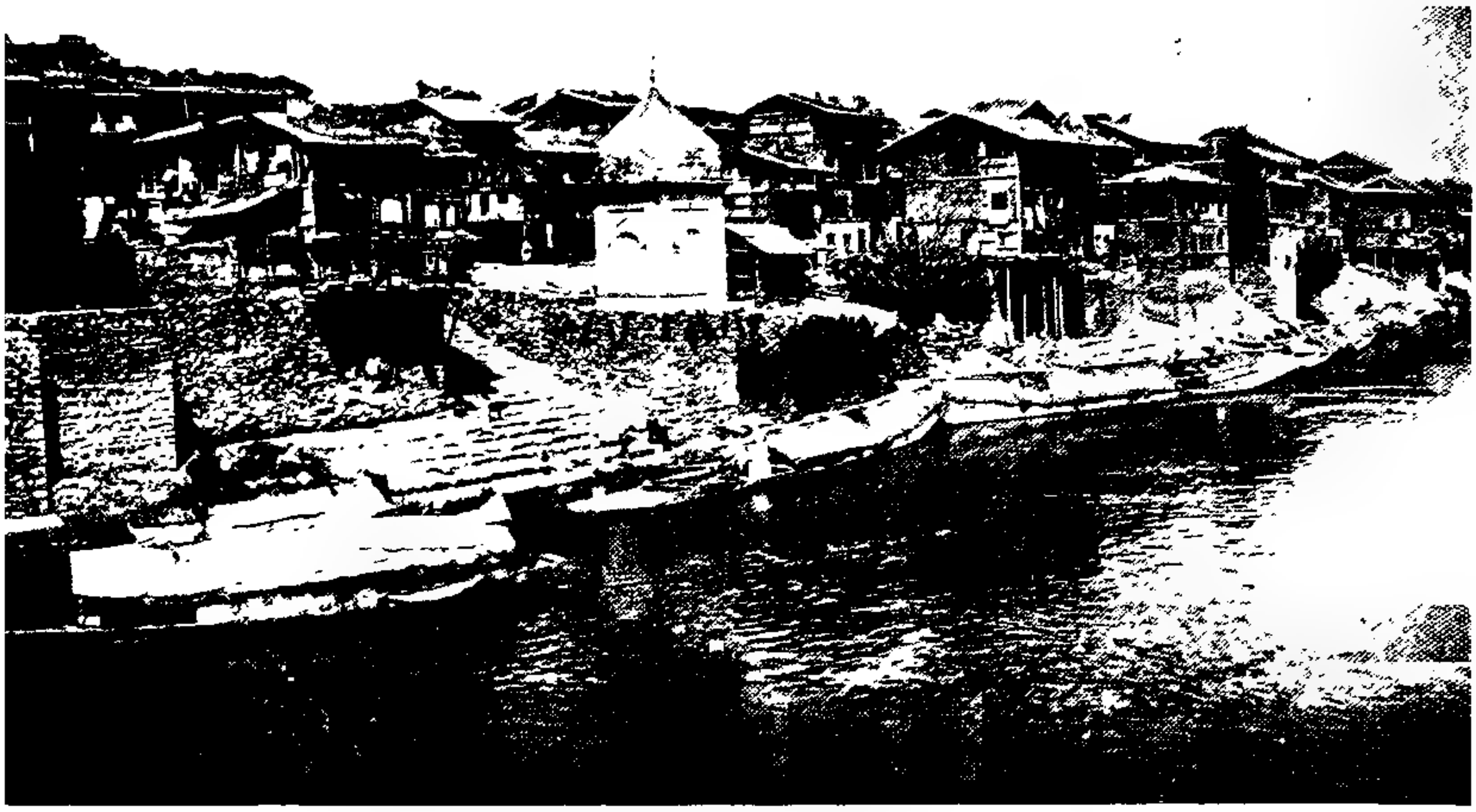
Vegetation of the Kashmir Valley and Lakes

By R. R. Stewart

THE lakes and waterways of Kashmir are unique. Famed for their beauty, having a marvelous setting with high mountains on all sides, they are also remarkable for their usefulness. As in Venice, they furnish many miles of highway and also provide an ideal summer residence for a large transient population. While the plains of India are in the grip of summer heat and the monsoon, the climate in Kashmir is so delightful that thousands of houseboats have been built for the use of summer visitors. In addition, many thousands of natives live in houseboats all their lives, having no homes on land. The floating gardens which they maintain furnish a great variety of vegetables for local consumption and for city markets, and many sheep and cattle are also fed on the produce of the lakes.

The famous Vale is roughly 80 miles long and from 20 to 24 miles wide. At one time it was practically all under water, but now most of it is fertile farming land. The Jhelum River meanders leisurely through the valley, widening out below the capital, Srinagar, into the shallow Wular Lake. There are three fine lakes in the Valley—the Anchar, Manasbal, and the Dal. The Moguls were so fond of the Dal Lake that near the beginning of the 17th century they built three large gardens on its shores—Shalimar, Nishat and Nasim. The first two are delightful terraced gardens with huge trees, many fountains, and numerous beds of flowers and velvety lawns. They are still kept in good repair and are visited by many thousands of people, especially on Fridays and Sundays. None of the ancient buildings at Nasim Bagh have been restored, but the site is main-



Terraced banks of the Jhelum River, at Kohala.

tained as a camping ground for summer visitors. There is room for scores of camps under the enormous CHINAR trees, or oriental planes, *Platanus orientalis*.

The new palace of the Maharajah faces Dal Lake, which is surrounded by rice fields, orchards, groves of willows, truck gardens and a number of populous villages.

The valley is 5,200 feet above sea level and the climate is temperate. It is abundantly watered by numerous streams coming down from the snow-fields on the mountains, but the rainfall in the valley is light because much of the rain is stopped by the Pir Pinjal range toward the plains. As a result, visitors can count on pleasant weather most of the time. There is fine swimming, boating, and fishing; polo, tennis, and golf are favorite games of visitors from the plains.

The people of Kashmir do not know much about chemistry, but they have practiced hydroponics for generations—and very successfully. They have wonderful water gardens without going anywhere to buy chemicals. Rafts or mattresses of cattail stems or rushes are prepared and silt from the lake bottom is put on top, weighting them down without sinking them. When there is enough soil for a seed bed, the little gardens are anchored by a pole at each end. They can be towed from place to place. This is sometimes a disadvantage, as thieves have been known to tow a garden away, and it is rather hard to prove property.

The native population is thrifty and very hardworking, and the land is intensively cultivated. There is a great deal of irrigation as water is abundant. In contrast to the average peasant of the plains of India, who raises only a few staple crops and a few vegetables, to satisfy his painfully monotonous diet, the Kashmir peasant raises a great variety of fruits and

Travelers cross from British India into Kashmir here.

vegetables as well as staple crops. Most of the temperate vegetables with which we are familiar are abundant, together with a number of food plants grown farther south. The crops, for example, include potatoes, squash, pumpkins, melons, eggplant, peppers, spinach, and other greens, beets, turnips, carrots, tomatoes, peas, beans, maize, okra, peanuts, onions, cabbages, and many more edible plants.

Grapes grow well and there are many kinds of nuts and fruits. Large quantities of apples, pears and walnuts are exported to the plains of India. The walnut, *Juglans regia,* occurs both wild and cultivated, growing up to 9,000 feet, but at higher altitudes the shells are thick and stony. There are peaches, cherries, mulberries, apricots, plums, quinces, almonds, strawberries and wild raspberries. Wild olives and wild pomegranates grow up to about 5,500 feet and so do various species of wild jujube (*Zizyphus*). Improved varieties of fruit from Europe are raised in some orchards, but few growers know anything about spraying. There is a silk industry based on the mulberry trees that grow both wild and cultivated.

Rice is the chief commercial crop in the valley, but there are many other field crops, wheat, barley and maize being the most important. Millet, peas, beans, lentils, sesame, flax, saffron, and a little cotton are also raised.

So much of the land is intensively cultivated that there is not enough pasture land for the horses, sheep and cattle of the valley, but the lakes help make up this deficit. The animals have learned to wade out and graze on the aquatic vegetation. From places that the animals cannot reach, women in native canoes, called SHIKARAS, gather leaves and stems to use for fresh fodder.

Vegetable gardens which are prepared along the shore gradually encroach on the shallow water as they are built up and fertilized by the silt

and decaying vegetation from the lakes. The gardeners go out in their flat-bottomed boats, thrust a pole deep into the luxuriant water weeds, twist it around and pull it up with a lot of mud attached. The boats are filled until they seem ready to sink, and then the treasure trove is spread on the lakeside gardens.

Poles are driven into the ground along the shore, slanting out over the water. Sticks are tied to them parallel to the ground, making trellises to support beans or climbing cucurbits, thus adding to the effective area of the garden.

The water-chestnut, *Trapa natans,* with its blue flowers and its peculiar fruit with three sharp spines, is a common sight. *Trapa* is an old inhabitant of Kashmir, being one of the commonest pleistocene fossils in the beds of clay remaining from extinct lakes.

Many acres along the lakes and canals are utilized for the cultivation of willows, the wood of which is used for cricket bats and also for fuel, as there is no coal in Kashmir. Most of the trees are pollarded and the twigs are cut for baskets and for wicker furniture, while the leaves and smaller branches are fed to the animals.

Almost all of the trees in the valley are cultivated. The two most noticeable kinds are the Lombardy poplar (*Populus nigra italica*) and the oriental plane, both of which, together with many flowers, notably bulbs

Inside Dal Gate at Srinagar, the capital of Kashmir. Lombardy poplars, believed to have been introduced by the Moguls, stand out against the Himalayas in the background. This photograph, made from the bridge over the gate, shows the narrow channel leading to the main body of water which is Dal Lake.

Chinar Bagh, or Plane-tree Garden, a small island in the canal connecting Dal Lake with the Jhelum River. Summer visitors hire a houseboat here for about 66 cents a day. Many people hire the houseboat with the cook-boat and the tiny shikara (shown in the picture) for getting about, for $20 or $30 a month. But foreigners have to have a typhoid shot before they can spend a vacation in this spot, because the canal supplies both drinking water and sewage.

such as saffron, irises, tulips, sternbergia, and ixiolirion, are supposed to have been introduced into Kashmir by the Moguls. There are hundreds of miles of Lombardy poplars along the roads; in the villages the finest shade trees are the planes. They grow to a great size, but all the large ones have become hollow through the activity of a fungus, a large polypore.

The cattails which grow in abundance are much used in making cheap but serviceable mats. The poorer people cannot afford rugs, and as they sit on the floor instead of on chairs, cheap mats are in demand. As a great many summer visitors live in tents, they too need mats. The cheaper houseboats are roofed with them, and mats are also used in making temporary lean-tos and shelters.

For years I marveled at the luxuriance of the water vegetation, which never seemed to diminish in spite of its being continually harvested. I marveled at the tropical luxuriance of the acres of lotus, at the shallow places covered with salvinia and various species of duckweed, at the tangles of potamogeton, myriophyllum, hydrilla, waterlilies, and the like, and the hundreds of acres covered with yellow limnanthemum. The luxuriance is due not only to a favoring climate, but to the habits of the population as well. The same situation that made cholera epidemics common (until mass

inoculation was started in recent years) causes the aquatic plants to grow with vigor and abundance. There is no sewage system, so the rivers receive all waste, and small dead animals are thrown in too. Clothes and utensils are washed in the waterways. Vegetation near the cities and villages is, therefore, well fertilized.

It is well known that the aquatic vegetation of a region is more cosmopolitan than the terrestrial plant population. There are endemic species in the mountains of Kashmir, but there seem to be none about the lakes. In fact, the Kashmir lake vegetation is not remarkable beyond its beauty, variety and luxuriance.

From the standpoint of beauty, pride of place goes to the lotus. I did not see any finer displays in the parks of southern Japan. There are two sizes of white waterlily, a large and a small one. The golden-colored limnanthemum is the most abundant of the handsome flowered plants. *Iris ensata* is not strictly an aquatic, but it lines the river banks and almost all the canals, covering many hundred acres and making a fine show in the spring. The graves in many of the Mohammedan cemeteries are planted with other kinds of irises, and many flowers spring up on the adobe roofs of buildings, including the mosques. There is a fine yellow buttercup which grows in shallow water to a height of five or six feet, and a small white water buttercup is widely distributed.

Perhaps the oddest plant is *Euryale ferox,* a relative of the waterlilies, but with small blue flowers. The large floating leaves are spectacular, with their uprolled edges revealing the red undersurface covered with masses of prickles.

Most of the genera and many of the species of the common aquatics of the valley will be familiar to botanists throughout the northern hemisphere. Below is a list of the dominant plants.

Pteridophytes

POLYPODIACEAE

Dryopteris thelypteris (L.) A. Gray.

MARSILEACEAE

Marsilea minuta L. Very common, especially in rice fields and ditches.

SALVINIACEAE

Salvinia natans L. Abundant.

Monocotyledons

TYPHACEAE

Typha angustata Chaub. Very common.
Sparganium ramosum Huds. Common.

NAIADACEAE

Potamogeton natans L.
" *javanicus* Hasskl.
" *perfoliatus* L.
Potamogeton crispus L.
" *lucens* L.
" *pectinatus* L. All abundant.

Naias major All.
" *minor* All. Both species are common but are submerged and so are much less prominent than the potamogetons.

ALISMACEAE

Alisma plantago-aquatica L. Common.
Alisma lanceolatum With. Common.
Sagittaria sagittifolia L. Common

BUTOMACEAE

Butomus umbellatus L. Common, with fine pinkish white flowers.

HYDROCHARITACEAE

Hydrilla verticillata Casp. Abundant.
Hydrocharis morsus-ranae L. Gregarious with pretty white flowers.

GRAMINEAE

Echinochloa crusgalli L. Common.
Leersia Hackelii Keng. Rare.

CYPERACEAE

Cyperus haspan L.
" *iria* L. Common along the edges of rice fields.
Carex pseudo-cyperus L.
Eleocharis sp.
Scirpus triqueter L.
" *lacustris* L.
" *erectus* Poir.
" *mucronatus* L.
Fimbristylis dichotoma (L.) Vahl.
Juncellus serotinus Clarke.
Cladium mariscus Br.

ERIOCAULACEAE

Eriocaulon Sieboldianum Sieb. & Zucc. Common in rice fields.

LEMNACEAE

Lemna minor L. Very common.
" *gibba* L. Very common.
" *polyrhiza* L. Very common.

JUNCACEAE

Juncus lampocarpus Ehrh. Common.
" *bufonius* L. Common.
" *compressus* Jacq.

Dicotyledons

POLYGONACEAE

Polygonum amphibium L.
" *lapathifolium* L.
" *nodosum* Pers.
" *mite* Schrank.

NYMPHAEACEAE

Nymphaea alba L. Common.
" *tetragona* Georgi. Occasional.
Euryale ferox Salisb. Gregarious. The leaves are always floating, not emersed as in lotuses near the shore.

The lotus is one of the most common and most beautiful of the aquatic plants growing in the Vale of Kashmir. Nymphaea tetragona is the small waterlily shown growing above it.

Nelumbium speciosum Willd. Lotus. Gregarious and abundant.

CERATOPHYLLACEAE

Ceratophyllum demersum L. Common.

RANUNCULACEAE

Ranunculus trichophyllus Chaix. Usually in running water.
" *lingua* L. Large plants and large flowers.
" *sceleratus* L.
" *muricatus* L.

CRUCIFERAE

Nasturtium officinale Br. The watercress is wild and abundant.
" *palustre* D.C. Common.

LYTHRACEAE

Lythrum salicaria L. Common about rice fields.
" *hyssopifolium* L. Occasional on mud flats.
Rotala densiflora (Roth) Koehne. Rice fields and wet places.
Ammania senegalensis Lamk. Wet places.

HYDROCARYACEAE

Trapa natans L. Free-floating like *Salvinia*.

HALORAGEAE

Hippuris vulgaris L. Common.
Myriophyllum verticillatum L. Common.
" *spicatum* L. Common.

The waters of Kashmir invite a lush growth of flowering plants. Here is Nymphaea alba, while the other species of waterlily known there, N. tetragona, is shown with the lotus on the preceding page.

UMBELLIFERAE

Sium latijugum L.

GENTIANACEAE

Menyanthes trifoliata L.
Limnanthemum nymphaeoides Link. Very common.

SCROPHULARIACEAE

Dopatrium junceum Ham. Rice fields, common.

LENTIBULARIACEAE

Utricularia flexuosa Vahl. Common.

COMPOSITAE

Bidens cernua L. Ditches and shallows.

AUTUMN EVENTS AT THE GARDEN

Saturday Programs

A NEW style of Saturday afternoon program will be given this fall at the New York Botanical Garden. After the showing of the Garden's motion picture in color to inaugurate the season Oct. 7, there will be a series of six talks on "Plants, Ordinary and Extraordinary, in the Botanical Garden's Collections" to be given by members of the staff. These will be interrupted on Nov. 11 by a group of motion pictures showing life in some of the Latin American countries. Autumn topics are:

Oct. 14	***Economic Plants***	*E. E. Naylor*	**Nov. 4**	***Palms and Cycads***	*E. E. Naylor*
Oct. 21	***Succulent Plants***	*E. J. Alexander*	**Nov. 18**	***Pines***	*Arthur Cronquist*
Oct. 28	***Aquatic Dwellers***	*E. E. Naylor*	**Nov. 25**	***Air Plants***	*E. E. Naylor*

Radio Broadcasts

Sept. 8 ***Penicillin, Twentieth-Century Drug*** — *F. W. Kavanagh*

Sept. 22 ***Garden Flowers of Autumn*** — *Mrs. R. A. Wetzel,* Mt. Vernon, N. Y.

Oct. 6 ***Harvesting a Home Crop of Canned Goods***
Lucy L. Hanan, Consolidated Edison Co. of New York, Inc.

Oct. 20 ***Bacteriology in Its Relation to Food***
Harvey K. Murer, Director, Biochemistry Section General Foods Corporation

Members' Days

Oct. 4 ***Products of Brazil—***
With Presentation of a New Exhibit — *W. J. Robbins*

Nov. 1 ***Flowers of Alaska—***
With Illustrations in Color — *Mrs. Jerome W. Coombs*

Dec. 6 ***We Look at Plant Material—***
And Comment on the Day's Exhibits — *T. H. Everett*

Courses

A NEW course in nature study, botany, and gardening for public school teachers of New York is beginning Sept. 20, in co-operation with the Board of Education. Classes will meet Wednesdays from 4 to 6 p.m. in the Museum Building, and alertness credit will be granted to teachers who complete the 15 sessions satisfactorily.

Alertness credit also may be arranged for the course in Field Botany starting Sept. 16. Other courses being given at the Garden this fall are:

TWO-YEAR SCIENCE COURSE FOR GARDENERS, starting Oct. 2.
Ecology and Plant Geography, Plant Pests and Diseases.

TWO-YEAR COURSE IN PRACTICAL GARDENING, starting Oct. 5.
Cultivation of Trees and Shrubs; J. H. Beale, instructor.

PLANT PROPAGATION, Autumn term, starting Oct. 14.

HOME LANDSCAPING, starting Oct. 2.
Planting the Home Grounds; P. J. van Melle, instructor.

Lawn Troubles and Their Control

By B. O. Dodge

WHEREVER a lawn is planted, even though the explicit directions given by James B. Jack in this Journal for July are carefully followed, there are likely to be fungi, bacteria, weeds, beetles, and bugs vying with the gardener for possession of the grass. A lush expanse of green means not only conscientious preparation of the soil, raking, seeding, watering, fertilizing, cutting, and later feeding, but it means also keeping an eagle-eye out for invasions by plant disease organisms and insect pests that are ever ready to annoy the lawn-maker. In the article below, Dr. B. O. Dodge, the Botanical Garden's Plant Pathologist, describes the principal lawn enemies individually and recommends methods for their elimination or control.

—C. H. W.

WHEN the lawn turns brown or the ground becomes bare, the first thought of many gardeners is that a fungous disease has attacked the grass. True, there are numerous fungi that infect our lawns, but there are also other causes for the killing of grass.[1] We have found, for example, that where soil has become too acid either from lack of application of lime or from previous treatment of the soil with acid arsenate of lead for Japanese beetle control, lawn grasses have died out and their place has been taken by weeds such as field sorrel, *Rumex acetosella*. Excessive application of commercial fertilizers often results in the killing of grass. Chinch bugs, Japanese beetles, and either too much or too little moisture are among those reasons why lawn grasses die out and the turf becomes brown. Some of the causes for failure of lawns will be presented here and suggestions for remedies will be given.

Fungous Diseases

APPEARANCE of irregular brown areas in the lawn frequently mark the presence of the fungous disease BROWN PATCH. The grass appears to be water-soaked and blackened. This is caused by the mold *Corticium vagum* (*Rhizoctonia solani*), which covers the grass in the morning when the dew is heavy. This stage is referred to as "smoke ring." Some grounds-keepers remove it with long bamboo rods or by dragging ropes or brush over the ground. This action tends to dislodge the dew so that the grass dries out quickly and the mold does not

[1] In *Nursery Disease Notes* for November 1937 (apparently written by R. P. White), eleven reasons are listed to explain why one should not think that all browning and death of turf grasses are due to disease. However, diseases cause some trouble in the lawn, and J. Monteith and A. S. Dahl in the Bulletin of the U. S. Golf Association (**12**: 87-187. 1932) give a most complete and reliable discussion of turf diseases and their control.

develop so vigorously. Too much nitrogenous fertilizer during midsummer and lack of lime seem to favor the disease.

The symptoms of DOLLAR SPOT or SMALL BROWN PATCH are much the same, only on a smaller scale; but this disease is caused by an entirely different fungus, *Sclerotinia homoeocarpa* (*Rhizoctonia* sp.).

Several times in recent years grass in Van Cortlandt Park has been attacked rather seriously by still another fungus, *Curvularia lunata*, which is related to species of the *Helminthosporium* group, which are often lawn grass parasites. For example, ZONATE EYESPOT is a familiar leaf disease of grasses caused by a species of *Helminthosporium*.

SPOT BLIGHT is another fungous disease of grasses, one which is caused by one of the damping-off fungi of the genus *Pythium*. This disease is favored by wet weather or by overwatering.

PINK PATCH is a conspicuous ailment caused by the fungous *Corticium fuciforme*. In spots which vary in size up to a foot or more in diameter, the grass dies out and becomes bright pink from a fungous growth which also develops small coral-red horns on the tips of the grass leaves. This is a warm, wet weather disease.

Most of the fungous diseases of lawns and golf courses may be controlled rather well by the application of fungicides of various kinds. The use of Bordeaux mixture, however, has been given up because of injury to lawn grass by the accumulation of copper in the sod where repeated applications have been necessary to control the fungi. The most reliable fungicides for lawns are corrosive sublimate (mercury bichloride) and calomel (mercurous chloride). During spring and fall periods these inorganic mercury fungicides are usually applied at the rate of about one pound to 6,000 square feet of lawn. Calomel at this rate is the more effective against DOLLAR SPOT. A mixture of one-third mercury bichloride and two-thirds calomel controls both BROWN PATCH and DOLLAR spot. During the hot days of midsummer, the dosage should be reduced to one or two ounces per 1,000 square feet of lawn—especially if the weather has been rainy so that the grass is tender. The lawn should be well watered after applying these fungicides.

Organic mercury compounds, such as Semesan, Nu-green, and Barbak, when applied according to directions furnished by the manufacturer, are excellent fungicides with which to control lawn grass diseases. Experiments[2] with tetramethyl thiuram disulfide, a rather new fungicide sold under the trade name of Thiosan, show that it is an excellent substitute for mercury compounds when used at the rate of four ounces per 1,000 square feet. In these experiments the Thiosan was mixed with three pounds of sand as a carrier and was applied at weekly intervals for two months beginning in June.

SNOWMOLD, caused by a fungus, *Fusarium nivale*,[3] which often develops on grass where the snow has recently melted away, also makes the grass look pinkish, but calls for a somewhat different treatment. The so-called "perfect" stage of this *Fusarium* is *Calonectria graminicola*. It is claimed that eastern snowmold, especially of Colonial bent grass, is caused by an entirely different fungus, *Typhula itoana*. Red fescues and strains of creeping bent are particularly susceptible to snowmold. Therefore this disease is best avoided by growing only varieties of grass that are less susceptible, such as velvet bent. Avoid covering the turf with straw unless the covering is removed very early in the spring. Anything that hastens drying of the surface of the ground after the snow thaws prevents the development of snowmold. Some recommend treatment of lawn grasses with mercury fungicides in late fall if snowmold is apt to develop. Use only two or three ounces per 1,000 square feet.

In general, it is advisable to exercise care in choosing varieties of lawn grass which are known to be resistant to the diseases which are apt to occur in our locality. Monteith and Dahl, for example, illustrate very strikingly that Metropolitan bent is highly resistant to DOLLAR SPOT, while under the same conditions Columbia bent is very susceptible and is killed out. In the same way they show how Washington creeping bent was highly resistant to the fungous disease ZONATE EYESPOT, while Virginia creeping bent was ruined under exactly the same conditions.

A new problem arises, however, if chinch bugs are prevalent, because some varieties of grass are susceptible and others fairly resistant to chinch bug in-

[2] Pirone (*N. J. Nursery Disease Notes* **14**: 36-39; 15: 1-4, 1942). Previous work by Harrington and others is referred to here.

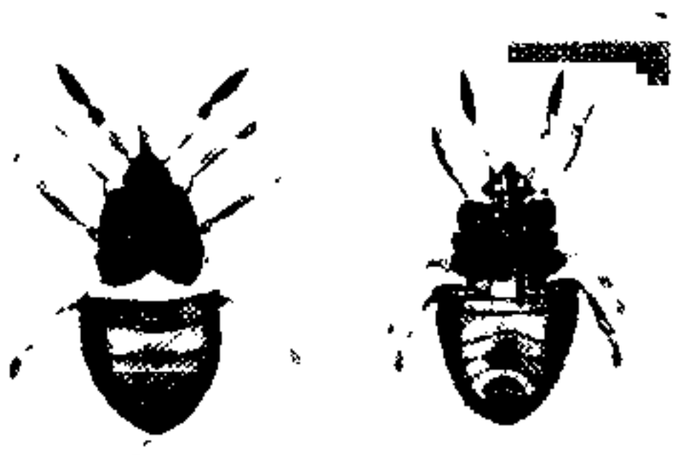
[3] Other species of *Fusarium* are soil organisms which often cause root-rot and wilt of other plants.

jury. So if it becomes a matter of choosing between resistance to chinch bugs and to fungi, remember that chinch bugs, once in a lawn, are often there to stay (they are like the seven-year itch—hard to get rid of), but that a disease is likely to succumb to proper treatment, and, given a chance, the grass will return.

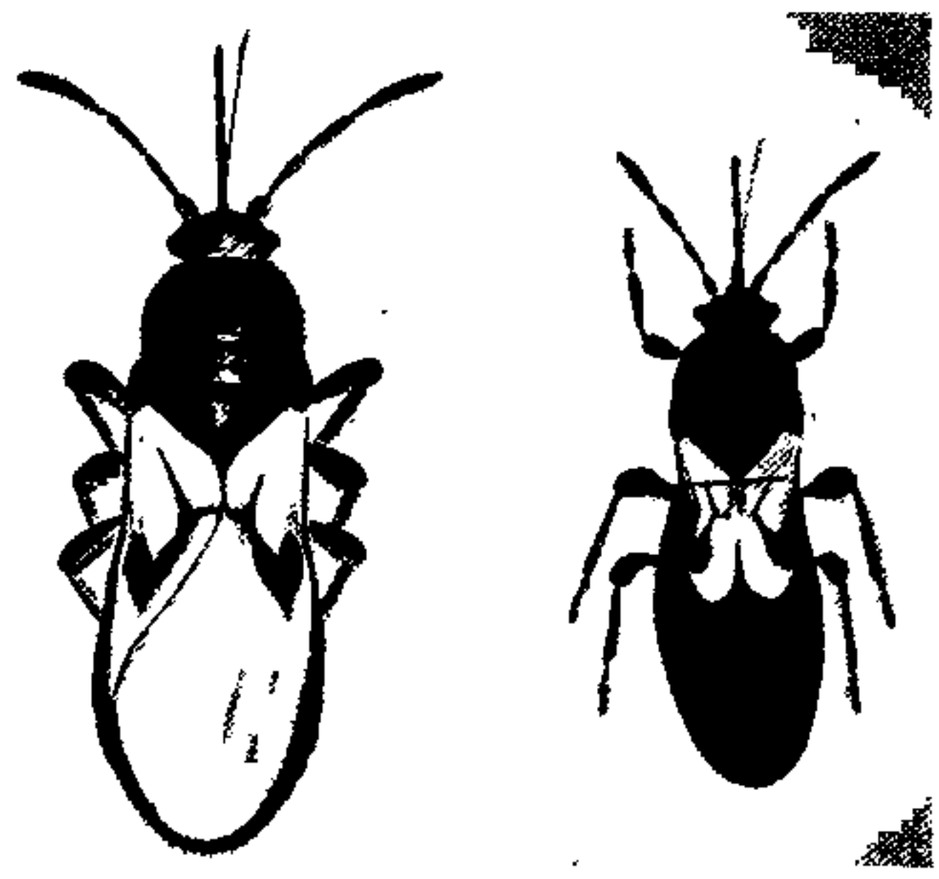
Chinch Bugs

ON the eastern seaboard, especially on Long Island, lawns are often badly afflicted with chinch bugs. It is easy to determine whether fungi, Japanese beetles, or chinch bugs are causing the damage by an examination of the sod. If it is BROWN PATCH, for example (which is not always a common disease), a moldy over-growth often appears on the grass tops in the morning, especially if there has been a warm rain previously or if a heavy dew has fallen. Where Japanese beetle grubs are present in numbers sufficient to kill the grass, one can roll up a layer of loose sod from the surface without effort. If chinch bugs are doing the damage, one will discover them if one parts the grass with the hands and looks carefully as they scatter in all directions. The young bugs are of a bright orange color with a whitish stripe across the back; the more mature bugs are brown or blackish with white wing rudiments. The adults are easily seen but one must have good eyes to see the youngest insects, despite their vivid color.

There are usually two broods of chinch bugs a year in this region, and it is



Young chinch bugs, top and bottom views. The large proboscis-like appendage, attached at the center of the under side of the head end, is carried beneath the insect, pointing backward as it travels. When the insect is about to feed, this proboscis is brought forward and placed against the grass to support the stylets which form the sucking organs. These have been dissected so as to show in the picture as hair-like structures.



Older chinch bugs, showing the white rudimentary wings and rather hairy body.

usually the second brood that is the more injurious. Since these are sucking insects, a contact insecticide must be used against them. In pre-war days it was possible to purchase a very finely ground nicotine dust with at least a one percent nicotine content. The coarse dust one obtains these days is practically useless unless applied very heavily. An efficient dust should have the fineness of snuff. If this fine, one percent nicotine dust is available, one should apply from 25 to 50 pounds per 1,000 square feet of lawn surface, rake it in evenly, and then repeat the operation after about a week or ten days if one finds some insects still present. The dust can be put on with a fertilizer spreader or thrown on by hand and then raked in well to secure a more even distribution. Watering the lawn just after the dust is applied is not recommended. While the first brood of insects may appear about the first of June and the second brood sometime around the middle of August, it is more satisfactory to determine the time of application by an examination of the turf. The dust should be applied at the time the orange-colored young are just beginning to develop in numbers.

A forty percent nicotine sulphate spray with soap is said to be satisfactory only when a potassium oleate soap is used. But if this kind of soap is used the spray is apt to cause considerable burning of the grass, although it does control the chinch bugs well. As a rule, the crowns

of the grass plants are not injured, and new growth will soon develop in spite of the spray injury. When rotenone dust with a one percent rotenone content is available, this can be used with more success than can be had with the coarse tobacco dust such as we are getting these days. Perhaps the very promising new insecticide "DDT" will eventually be adapted for chinch bug control.

Experiments performed to determine the relative susceptibility of different varieties of grasses to injury by chinch bugs were reported[4] a few years ago. The fescue grasses, such as the fine-leaved, European red, rough-stalked meadow, and sheep's varieties were fairly resistant, very little damage being done. Chewing's New Zealand fescue and Kentucky bluegrass varied greatly in susceptibility according to location. In some situations both were rather resistant while in others only moderately so. On the other hand, redtop, Prince Edward Island bent, velvet bent, seaside creeping bent, and German bent were all very susceptible to injury. The Astoria Colonial bent and the New Zealand bent were only moderately injured.

During rather wet seasons the snow-white fungus parasite *Sporotrichum globuliferum* seems to be very efficient in controlling chinch bugs. Practically all the adult insects will be found dead and covered with a white mold, while the young, normally bright orange-colored individuals will be turning a greenish hue and will be less lively than usual. These all eventually die of the disease. During hot, dry seasons, however, especially where lawns are cut altogether too low, the fungus cannot develop and then one must resort to the application of nicotine dusts or other contact insecticides.

Adult chinch bugs live through the winter in the shelter of clumps of old grass and weeds allowed to grow in nearby places, or in the lawn itself later in the fall. Burning off of these shelters will greatly reduce the chinch bug populations, which will otherwise come out and lay eggs in the new grass in the spring. But this is seldom done as it is usually too much trouble, especially since the bugs are hidden from sight and we have other, "more demanding," gardening jobs to do in the fall.

[4] G. F. MacLeon and Kenneth E. Maxwell. Jour. Econ. Ent. **30**:432-437. 1937.

Crabgrass Control

HOME owners are often discouraged by the rapidity with which the crabgrass[5] crowds out their good lawn grasses. One reason is that its seeds germinate in May and the plants thrive on the heat and moisture of summer. It is most luxuriant during July and August when Kentucky bluegrass, for example, is more or less dormant. Later in the summer or fall, at the time when the good turf grasses should begin new growth, crabgrass will be present in such quantities as to smother the shoots of the finer-leaved varieties.

The trouble with crabgrass is that most of the methods recommended for its elimination involve labor that the home gardener looks upon as a nuisance. However, there are ways of getting rid of it, and L. W. Kophart of the Bureau of Plant Industry has written a leaflet[6] on the control of this pest. Crabgrass, he points out, does not thrive in shade. Therefore, he says, if one can provide a week or ten days of artificial shade, the pest tends to disappear. If one stimulates the lawn grass to make strong growth in early spring so that a mat of leaves covers the ground, crabgrass seedlings will die. This method calls for liberal application of suitable fertilizers. Shade can be provided by setting the lawn-mower so that the grass is not cut closer than four inches. After about June 1, the cutter-bar can be lowered to cut at about two inches. Most people would consider this process impractical—that is, too much trouble—and very few home owners would want to see their lawn covered with grass four inches high, even for only two weeks and even if this meant the elimination of crabgrass.

One can prevent crabgrass from going to seed if it is allowed to grow during August and early September, so that the flowering heads can be clipped off by setting the cutter-bar of the mowing machine high. The operation should be repeated when the flowers of the second crop open. But again, this would probably be considered too much trouble.

One should avoid sprinkling lawns so that just the surface soil is kept moist, as this habit favors crabgrass. For lawns, as for vegetable gardens, when one does

[5] *Digitaria sanguinalis* is large hairy crabgrass and *D. Ischaemum*, smooth crabgrass.

[6] Crabgrass Control. U. S. Dept. Agr. 1939.

apply water, the ground should be given a thorough soaking.

Another method involves the covering of the lawn with tar paper or other material for about ten days in July or early August to exclude all light. Crabgrass will die but the perennial lawn grasses will recover within a few weeks.

Chemical weed killers for crabgrass are still either in the experimental stage or are not practical, according to Kophart.

Under the title "***Vital Facts on Mowing,***"[7] good advice is given about mowing the lawn. "Except in the case of creeping bent, any grass will be much stronger and healthier if a growth of 1½ or 2 inches remains after clipping," this article says.

"Higher cutting of grass enables it to better withstand drought because such grass has a more extensive root system which can reach the reserve moisture abundant at greater depths. Then, too, surface evaporation is reduced because the grass acts as a sort of mulch.

"'Close mowing favors the encroachment of weeds. It leaves the grass weak and thin so that it cannot compete with dandelions, crabgrass, chickweed, etc. It is also more subject to injury by grubs and sod webworms, as weak roots are unable to withstand attacks of these pests.

"Agricultural authorities agree that grass should be cut at a height not less than 1½ inches and preferably 2 inches. One difficulty encountered in following this practice is to secure suitable high cutting lawn mowers. Many mowers can be adjusted to cut this high or extension brackets can be obtained to lower the wooden roller. If this is not feasible, the old rollers can be replaced by larger ones which will raise the knife the proper amount.

"The importance of high cutting cannot be over-emphasized. It is most important during the summer months and again in late fall. Grass is less apt to winterkill if it goes into the winter with a growth of two or three inches."

Japanese Beetle

ONE of the insects most destructive to grasses in lawns and golf courses in our region is the Japanese beetle (*Popillia japonica*), although the somewhat similar grubs of the brown Asiatic beetle, the rose bug and May beetles may also be destructive at times.

At present there are two practical methods of preventing damage to lawns by these insects. One involves the poisoning of the grubs as they feed on the roots of the grass; the other involves the principle of biological control, whereby other insects or other organisms which feed on the grubs or which parasitize them are introduced or are present naturally in a region. Of course, any measure that reduces the adult beetle population will be doubly beneficial.

Japanese beetle grubs as shown when dead turf is rolled up.

To poison the grubs as they feed, arsenate of lead is used. When ground for a new lawn is being prepared, the arsenate can be incorporated in the soil before the seeding is done. At this time one should use 15 to 30 pounds of the arsenate per 1,000 square feet. While certain kinds of grass seed seem to germinate very well with a normal development of roots, even if the arsenate is raked in with the topsoil along with the seed, it is sometimes claimed that germination is delayed. Probably the best method, therefore, is to prepare the soil, apply the arsenate, and then go over the ground with a rototiller, drag, or rake before sowing the seed.

[7] Lawn Care **5**:8. 1932. Published by O. M. Scott & Sons Co.

If a lawn is already established, lead arsenate may be applied to the surface. It may require some months for the poison to be carried down into the soil along with the water from rains and snow, but the grubs will eventually be killed as they feed. On the surface the arsenate is usually applied at the rate of 10 pounds per 1,000 square feet of lawn. It may be put on at any time of the year so long as the ground is not frozen or covered with snow. The arsenate can be mixed with sand, or, if it is desired to include some top dressing, fine dry soil can be added and the mixture broadcast over the lawn by hand or with a shovel. A more even distribution is obtained if one scatters the mixture thinly as one walks back and forth and then repeats the operation in a cross-wise direction, as in sowing grass seed. Otherwise it may be necessary to rake the lawn for the sake of evenness. For larger lawns a small commercial fertilizer spreader results in a better distribution, and the application of the material requires only a short time.

Just how many years of protection are guaranteed by one application of the arsenate depends somewhat on the nature of the soil. Good protection is obtained for at least five or six years. One can determine when a second application is advisable by sampling the sod and the soil below it in May or June after the grubs have come to maturity. If only a few grubs are found here and there, the second application can be delayed a year or two. One should avoid applying too much arsenate of lead, as the soil tends to become too acid for the growth of most lawn grasses unless it is neutralized with lime or by some other means.

In the Orient, the Japanese beetle is naturally controlled by a number of parasites which have developed through the course of centuries, but for several reasons these insects have not proved adaptable for efficient control in this country. Eelworms, *Tiphia* wasps and other insects sometimes attack the beetle grubs in our lawns, but not to a beneficial extent.

State and Federal stations have conducted many experiments with these and with other organisms for control of the Japanese beetle. The most promising today seems to be a certain bacterium which attacks the grubs and causes the so-called milky disease. The grubs become somewhat discolored and one can squeeze out from them a thin milky juice. The bacterium most in use is a strain of *Bacillus Popilliae*. This is a spore-forming organism, which in the spore stage is very resistant to heat, cold, and dry or wet conditions for some time —at least three years.

A method of developing a product which incorporates about three billion spores of the bacterium in an ounce of dust has been worked out, but the dust can be prepared only by experts, because the bacteria must be injected into a definite part of the grub and then only for a certain distance—otherwise the grub is apt to die a premature death without having developed the disease to any extent. The production of this dust is covered by a patent under the control of the Department of Agriculture.[8]

Limited amounts of this dust could be purchased from certain seed stores for a short time (and until just recently) at about $5 a pound. About one level teaspoonful, or two grams, is deposited on the lawn every ten feet each way. This requires about 1¾ pounds per acre. Results are not obtained at once because the even distribution of the spore dust in the soil requires some time. For small areas the expense of applying this dust is about the same as the cost of applying arsenate of lead, the difference being that one application of the dust should be sufficient for many years, and perhaps for all time. The use of the spore dust has not been in vogue for a long enough time to enable one to answer the question regarding the ultimate efficiency of the milky disease in controlling the Japanese beetle.

One reason why the dust is placed in spots instead of broadcasting it is that the grubs near the spots will be inoculated with sufficiently large numbers of spores to develop the disease with rapidity. The grubs soon disintegrate, and the spores from their bodies remain viable for three years without passing through an-

[8] A rather detailed description of the methods worked out for producing spore dust was written by S. R. Dutky, under the title "Method for the Preparation of Spore-Dust Mixtures of Type A Milky Disease of Japanese Beetle Larvae for Field Inoculation." ET-192, May 1942, U.S. D.A., Bureau of Entomology and Plant Quarantine. R. T. White and P. J. McCabe of the same bureau have issued under the title "Colonization of the Organism Causing Milky Disease of Japanese Beetle Larvae" Circular E-605, October 1943. C. H. Hadley, also of this office in the U.S.D.A., is the author of another circular issued in February 1943 on "Milky Disease for Control of the Japanese Beetle."

other host. As long as these spores are capable of resuming growth, any stray Japanese beetle grubs in the ground are liable to infection and ultimate death. The adult beetles themselves help to spread the disease, because in laying their eggs they are apt to become contaminated with the bacterial spores and thus, as they travel about to lay more eggs, every day, they inoculate new areas.

Asiatic Beetles

Some ten or fifteen years ago we had in the grounds of the New York Botanical Garden a large population of the brown Asiatic beetle, *Autoserica castanea*. The grubs ate the grass roots, and the adult beetles came out at night to destroy China asters and other plants which were their favorite foods. For some reason this brown beetle is very scarce here now, but it certainly persists in other places. If it is to be eliminated by a bacterial dust, new strains must be developed, for the particular strain of *Bacillus Popilliae* which kills the Japanese beetle apparently does not affect the grubs of the brown Asiatic beetle. Meanwhile, the same arsenate of lead treatment that is used against Japanese beetles may be applied to the ground to kill the grubs of the brown Asiatic beetles.

Notes, News, and Comment

From Table Mountain. Unexpected letters, written from the top of Table Mountain in the interior of Surinam, were received from Dr. Bassett Maguire the middle of August. After a seven weeks' journey by dugout canoe and on foot, he had reached the top of Table Mountain July 30—a day or two ahead of schedule. Writing on Aug. 5, he said:

"To date I've seen very little of this great sandstone block, but indications are that collecting will be very good and offer adequate returns for the efforts of all of us. The flora—at least the savannah flora—is much like that of Kaieteur and I presume Roraima. . . . The real work here hasn't begun. The terrain and bush are exceedingly difficult. I'll probably be here until the middle of September—New York in early October."

On August 4 a plane was to drop a radio-telephone, mail, and some supplies to Dr. Maguire, but the plane was forced to make a crash landing on the mountain top, so his letters were carried back by the pilot, whom Dr. Maguire sent downriver with some of his own men.

Argentine Plants. A noteworthy acquisition in the library this year is the folio volume "Genera et Species Plantarum Argentinarum I" edited by H. R. Descole. Wide margins, a relatively small type-block, large type, and heavy paper such as have become unfamiliar in recent years in the United States make this a rather spectacular volume. Three families are treated: Zygophyllaceae by Descole, C. A. O'Donnell, and A. Lourteig; Cactaceae by A. Castellanos and H. Lelong, and Euphorbiaceae by Lourteig and O'Donnell. There are 138 full-page plates to illustrate these plant groups, including full color, half-tone, and black-and-white illustrations of the plants, habitat photographs, and distribution maps. Eleven additional color plates at the end show plants in other families.

Pictures on Sale. Three new items of interest have been placed on sale at the information booth in the Museum Building—a mailing folder, a calendar, and a selection of English prints showing children, animals, and flowers.

The folder contains ten postcard-size views of the flowers and flower displays to be seen at the Garden from April through the winter. This is the first time that the Garden has had such a folder to offer. It sells for 20 cents and may be mailed for a cent and a half.

The calendar, which is made in Switzerland, measures 6½ by 9½ inches, and each month is illustrated with Alpine flowers in color. The pictures may be cut from the sheet and used as postcards after each month has passed. The price is $2.25.

Two of the English prints are on display in the rotunda of the Museum Building, and a catalog mounted beneath each one shows the other subjects available. They are the work of Muriel Dawson, and the titles are: The First Aconite,

Primrose Wood, Three Scotties, Feeding the Calf, The Mallard Family, Squirrel's Breakfast, Rabbits, Happy Springtime, On the Seashore, and The Goosegirl. All except the seashore picture contain familiar English wild flowers and flowering shrubs, and a list of the plants recognizable in each picture is kept on file at the information booth. The pictures are all in color and the majority of them measure 17 x 20½ inches. They sell for $3 each, plus a 25-cent mailing charge.

New Position. Mrs. Lazella Schwarten, who has been Library Assistant at the Garden since the fall of 1936, is leaving Sept. 15 to become Librarian at the Arnold Arboretum, Jamaica Plain, Mass. Mrs. Schwarten's first work at the Garden was as a typist. During the winter of 1936-37 she studied in the Library School at Columbia, and since then has been enrolled in the Science Course for Gardeners at the Botanical Garden. She has served as Bibliographer for the Torrey Botanical Club since 1940, and will continue this work while in her new position. She has also been a co-editor of the *Taxonomic Index* published at the Garden by the American Society of Plant Taxonomists.

Army. Louis Politi, who has been Arboretum Foreman at the Garden since Dec. 1, 1942, left Aug. 21 to join the U. S. Army. He began working at the Garden on Feb. 1, 1942, coming from Washington, D. C., where for three and a half years he had been in charge of an estate. While at the Garden he studied both in the practical and scientific courses in gardening. Richard Mampel, who began as an apprentice gardener in 1941. has been named acting foreman.

Visitors. J. T. Baldwin, returning from a two-year sojourn in Brazil on a rubber project, stopped at the Garden during August. He is on leave of absence from the University of Michigan. Other recent visitors have included Francis Drouet, Chicago Natural History Museum, with Donald Richards, also of Chicago; M. Le Hors, St. Pierre-Miquelon; Ramón Garcés, Secretary of Agriculture of Colombia, who is in the United States as a guest of the Co-ordinator of Inter-American Affairs; Dr. Carolina Herrera, a professor of botany in Cuba; and John D. Dwyer, Albany College of Pharmacy.

Current Literature At a Glance*

Middle America. The islands and nations which come between the two American continents are being intensively studied by the United Fruit Company, and through this company's Middle America Information Bureau at 9 Rockefeller Plaza, New York 20, facts and figures about these regions and their industries are being distributed gratis to those who have special need for the information. Mimeographed material has been prepared and printed material also provided on special products or potential products of these regions, and on the people and resources of the political units, with emphasis on the interdependence of the United States and these near neighbors. Of particular value is a selected list of books about the region, prepared by Charles Morrow Wilson, whose recent book "Middle America" is to be reviewed in this Journal soon.

Prairie Scenes. The beauty of the North American prairie from the time the first pasque-flower opens its furry bud in April until the prairie grasses themselves take on autumnal coloring is subtly introduced as a backdrop for some significant facts about prairie lands by J. E. Weaver in a recent number of *The American Scholar,* published by Phi Beta Kappa. Dr. Weaver mentions the different prairie regions of this continent and names the major types of grass that thrive on them. He describes the life habits of the prairie plants—the grasses and forbs—and explains how they accommodate themselves to each other and to the surroundings in their competition for survival, notably by sharing soil at different levels, obtaining light at different heights, and making maximum demands for soil water and nutrients at different seasons. Thus he points to the high degree of equilibrium existing between the vegetation and its habitat. "Hence prairie is much more than land covered with grass," he concludes. "It is a slowly evolved, highly complex organic entity, centuries old. It approaches the eternal. Once destroyed, it can never be replaced by man."

* All publications mentioned here—and many others—may be found in the Library of the Botanical Garden, in the Museum Building.

Ragweed. One of the projects most frequently suggested for the jobless after the war is the nation-wide elimination of ragweed, known to be one of the major causes of hayfever. The Massachusetts Horticultural Society has issued a useful little illustrated booklet entitled "Ragweed and its Eradication." Copies may be obtained for 10 cents.

Insect Guide. A 16-page free vest-pocket primer on insects in the victory garden and what to do about them has been issued by the U. S. Department of Agriculture.

Notices and Reviews of Recent Books

(All publications mentioned here may be consulted in the Library of The New York Botanical Garden or may be purchased on order through the Library.)

Brief Notes on Recent And Varied Volumes

Hawaiian Flowers

TROPICAL BLOOMS—A Portfolio of 40 Flower Prints from Photographs. Henry Inn. Fong Inn's Limited. Waikiki. 1944.

Flower prints in twentieth century style are presented here as reproductions of photographs made by E. Asato. A brief description of each is given by Mary Dillingham, author of "Flowers of Hawaii" which was reviewed here in March 1939. The plants, flowers, and *objets d'art* were provided by Alice Cooke Spalding, and the identifications were made by Harold St. John, Professor of Botany at the University of Hawaii. Especially to one who has seen the gardens of Hawaii will these large illustrations bring pleasure. Mr. Inn will be remembered as the author of "Chinese Houses and Gardens" which was reviewed in this Journal in March 1941.

Erosion

YOUR LAND. Practical Methods for Preventing and Curing Soil Erosion. 43 pages, illustrated. Bethlehem Steel Co., Bethlehem, Pa. 1942.

A dramatic and picturesque account of what causes erosion, what happens when it occurs (in terms of the land and its people), and what can be done by the individual land-owner to prevent such devastation. Information and illustrations have come largely from the U. S. Soil Conservation Service, with assistance from staff members at Cornell University and Pennsylvania State College.

Folio Volume on Garden Flowers

WARD'S BOOK OF GARDENS. 63 pages, illustrated, indexed. Montgomery Ward & Co., Inc. Chicago. 1944.

A glorified catalog in a stupendous volume measuring 18 x 16 inches, vividly illustrated in color on every page with pictures of flowers and evergreens, shrubs and trees, vegetables, and fruits. The end-papers, front and back, give cultural directions.

Saving our Natural Resources

CONSERVATION IN THE UNITED STATES. A. F. Gustafson, C. H. Guise, W. J. Hamilton, Jr., H. Ries. Second edition. 477 pages, illustrated, indexed. Comstock Publishing Co., Ithaca, N. Y. 1944. $4.

In the short space of five years since the first edition appeared, so many new aspects and methods of conservation have arisen that the four authors of this excellent book found a great deal of rewriting necessary. The introduction, presenting some of the history and problems, with the present-day outlook on our natural resources, as a result of their excessive use for war materials, has been rewritten and enlarged, and new material has been added to a number of the chapters. All four authors are members of the faculty of Cornell University.

CAROL H. WOODWARD.

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THE NEW YORK BOTANICAL GARDEN

and what it means

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Briefly, this program comprises (1) horticultural display, (2) education, (3) scientific research, and (4) botanical exploration. To further this work and to disseminate useful information about plant life to the public, the Garden issues books and periodicals, both scientific and popular, and presents lectures, programs, radio broadcasts, and courses of study in gardening and botany. The laboratories and large herbarium and library serve the staff in its research and educational work, while the extensive plantings at the Garden give the public vistas of beauty to enjoy the year around. The public is also free to use the Botanical Garden's library, and, under direction, to consult the herbarium.

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Personal conferences with staff members, upon request, on problems related to botany and horticulture.

Free announcements of special displays, lectures, broadcasts, programs, and other events.

Use of lantern slides from the Garden's large collection, under established regulations for such loans.

A membership card which serves as identification at special functions at the Botanical Garden and also when visiting similar institutions in other cities.

* * * *

Garden clubs may become Affiliate Members of the New York Botanical Garden, and thus receive certain privileges for the club as a unit and others for individual members. Information on Garden Club Affiliation will be sent upon request.

* * * *

Classes of membership in the New York Botanical Garden are:

	Annual Fee		*Single Contribution*
Annual Member	$ 10	Member for Life	$ 250
Sustaining Member	25	Fellow for Life	1,000
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All requests for further information should be addressed to The New York Botanical Garden, Bronx Park, New York 58, *N. Y.*

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

CAROL H. WOODWARD, Editor

A PIECE OF DETECTIVE WORK

Second in a series of editorials designed to show the unique and specialized services that are furnished to the public without cost by the New York Botanical Garden

ONE of the large drug companies recently sent a young lady to the New York Botanical Garden with a piece of paper on which there was a single Chinese character. This ideograph was the name of a plant described by the Chinese as containing an antimalarial drug. The company wished to identify this plant, obtain specimens of it, and investigate its reputed antimalarial properties, because malaria is one of the most serious diseases affecting our armed forces in the tropics.

With the assistance of our staff and the facilities available in our library, we were able to discover the scientific name of the plant represented by this Chinese character. We found that we had a dozen of the plants growing in the New York Botanical Garden; it is a hardy shrub four or five feet in height. We learned that it was not available in commercial nurseries, so we furnished propagating material to the drug company and located two additional non-commercial sources.

Whether this plant will prove to be of any practical value in the control of malaria we cannot say. Our function was completed when we made it possible for the expert chemists and pharmacologists of the company to investigate the possibilities which this plant may offer.

This shows how the staff and the facilities of the New York Botanical Garden contribute to problems which have far more than a local significance; to problems which are national and international in character.

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The Early Iconography of Tobacco

By Jerome E. Brooks

I.

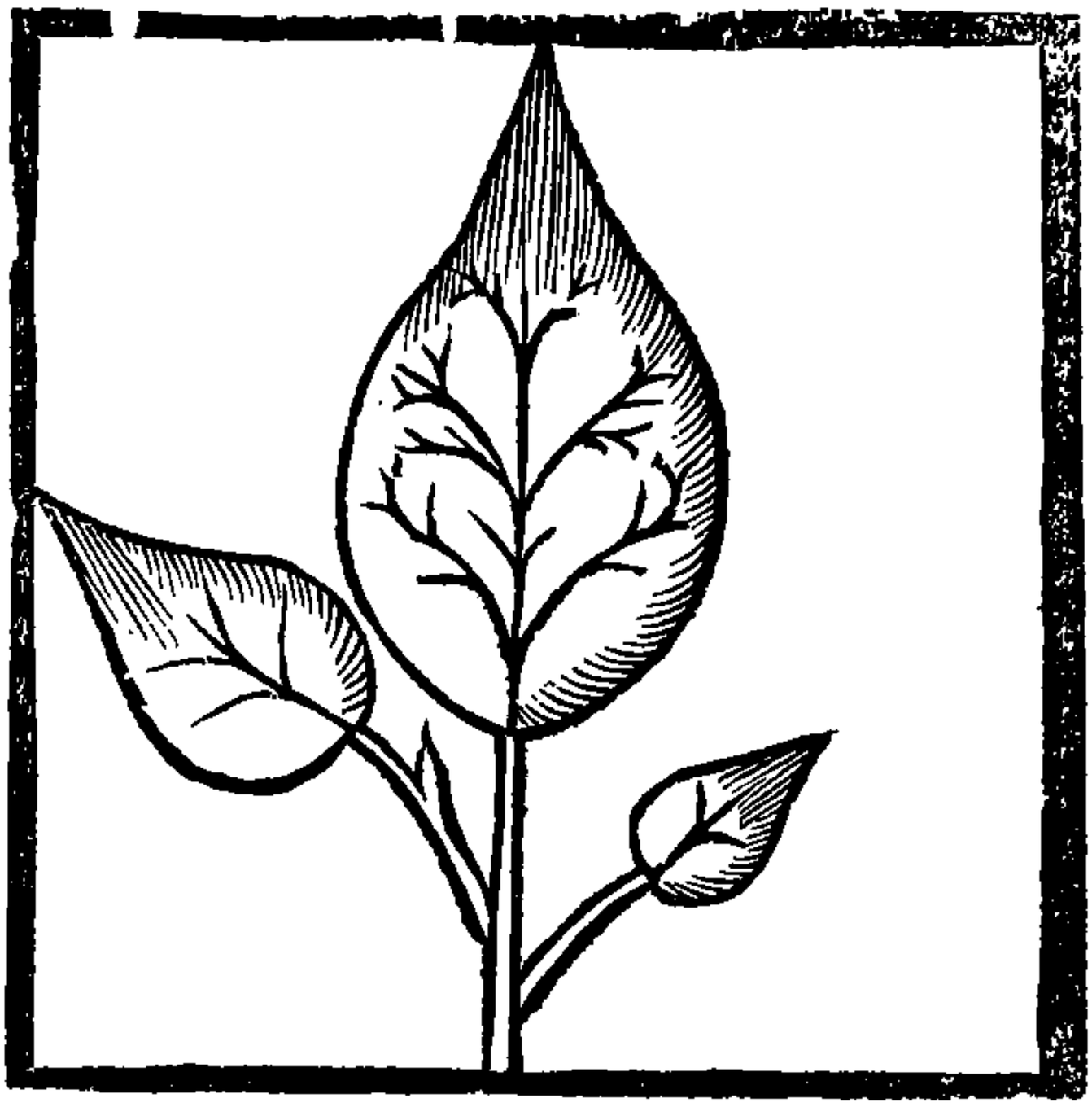
A CONSIDERABLE number of persons—seamen and merchants, soldiers and residents of port towns—were indulging in the subtle new fashion of smoking in western Europe by 1550. But few of them, except for the mariners who had been to the Americas, had ever seen the plant whose dried leaves they enjoyed, nor could any curious student then have found a published picture of tobacco.

We have no accurate date for the introduction of the plant into Europe. Francisco Hernández, physician to Philip II of Spain, who had gone to Mexico to collect specimens of its flora, is supposed to have been the first to have brought back the living plant to Spain. (Some authorities think, however, that he brought merely the seeds.) The cosmographer, André Thevet, claimed that it was in France that tobacco had first been grown in Europe. During the course of a published controversy with De Léry, he insisted that he had introduced the seeds from Brazil, in 1556, and that he had grown them in his garden at Angoulême. It is probable that, even a few years earlier, interested botanists and herbalists had cultivated the plant in their "physic gardens" in Portugal or Spain.

In any event, by 1555-1560 tobacco was growing in Portugal, Spain, Belgium, France, and the Netherlands. Within the next decade or so, it was a product of the gardens of Italy, England, Germany and Bohemia.

The first to give an account (however garbled) of tobacco, its effects and uses, was Fernández de Oviedo y Valdés, Spanish historian of the West Indies. He does not illustrate the plant in his first published description of it, in *La historia general delas Indias,* Seville, 1535. But he did provide a cut of another plant which, by curious circumstance, was to assume a place of inferential importance in the history of tobacco. This Indian simple, which Oviedo called "perebecenuc" was employed by the

natives as a vulnerary. Its remedial effects were said to be remarkable. No one now seems to know what this plant was, and Oviedo did not relate it to tobacco. But in his *De Simplicibus Medicamentis,* Antwerp, 1574, Charles de l'Escluse,* the foremost French botanist of his day, said that Oviedo had called tobacco "perebecenuc." De l'Escluse may have confused the two plants because, by then, tobacco was generally accepted as the most effective vulnerary known. The terms Oviedo employed to praise "perebecenuc" were very similar to those which others applied to tobacco. Whatever the reason for the confusion the name of an unknown plant became a synonym for tobacco (or its then equivalents) and was retained for many years. Thus, in the iconography of tobacco, the earliest illustration to be considered is of a plant other than tobacco!



"Perebecenuc" — supposedly tobacco, but actually some other, unknown plant, illustrated by Oviedo in 1535.

It should be remembered that, in an age of diseases and recurrent plagues, the greatest desideratum was a panacean herb. By 1555-1560 tobacco had acquired a reputation—happily lost in our own time—as a catholicon, God's wonder-working herb; the very touchstone of all medicinal plants. This distinction was, at first, confined to the Iberian Peninsula, but within the next two decades its popularity as the prime medicinal plant had spread to the borders of Russia, and its therapeutic uses comprehended all the ills to which man's flesh is heir. Herbalists, barbers (who were also surgeons), physicians and charlatans busied themselves with growing tobacco in their gardens; pharmacists kept conspicuous stocks of dried tobacco leaves on their shelves; botanists, accepting the contemporary scientific opinions without question, further advertised the plant's medicinal virtues in their published works.

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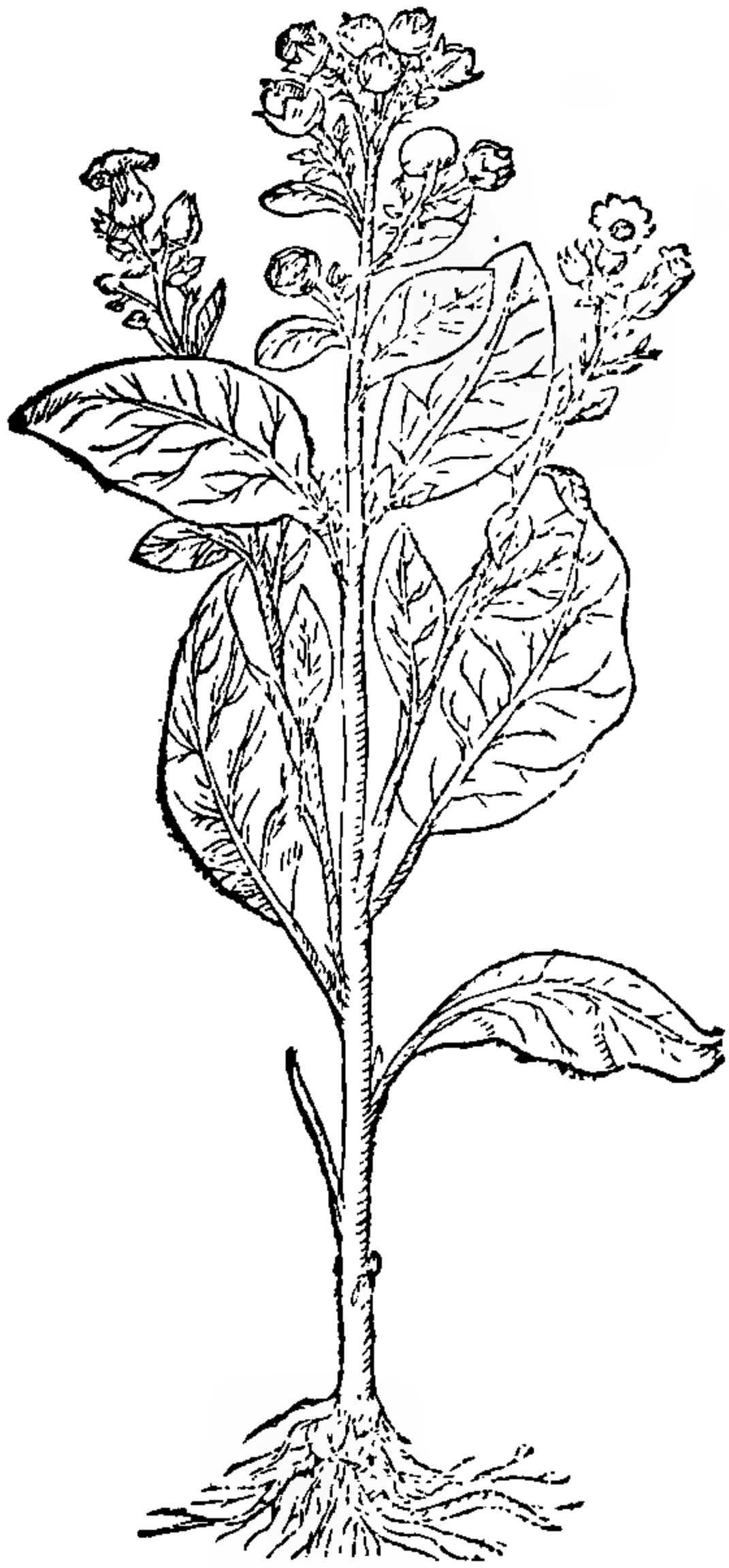
* Also known as Lécluse and Clusius.

The first printed illustration of tobacco is that provided by Rembert Dodoens in his *Cruydeboeck,* Antwerp, 1554. There he displays a specimen of *Nicotiana rustica* (var. *texana*) under the Latin name of "Hyoscyamus luteus." This synonym and its equivalents ("yellow henbane" in English) were retained for this species, in many works, up to the period of Linnean classification. Dodoens had placed it under the *Hyoscyami* because of its solanaceous characteristics. He thought it to be the "second kind" of the Hyoscyamus (henbane) of Dioscorides and Pliny. He did not then know it was tobacco, and nothing in his text reveals its American origin. Twenty years later, in his *Purgantium Aliarumque eo Facientium,* he presented a more elaborate cut of the plant, but again failed to identify it as American tobacco. He remarked there that it was so rare that it was not to be found in Belgium, except occasionally in gardens, and compared it with the yellow Hyoscyamus of the authorities of antiquity.

The famous botanist, Pietro Andrea Mattioli, presented the second original illustration of tobacco in his *New Kreüterbuch,* Prague, 1563. Again *N. rustica* (var. *texana*) is depicted, although, at first glance, there is no resemblance to the cut in Dodoens' work. In his description of it Mattioli says nothing of its original habitat, but he recognized its rarity among the varieties of Hyoscyamus by remarking that it was occasionally observed in gardens as a "foreign guest." The specimen, which was cap-



Confusion as to what tobacco really was caused Dodoens to label his drawing of Nicotiana rustica "Hyoscyamus luteus."

tioned "'III. Hyoscyamus," appears to have been sent to him in Bohemia by an Italian correspondent. As an evidence of the complexities of nomenclature then, it should be noticed that when the same illustration appeared in Mattioli's magnificent herbal, his *Commentarii in sex libros . . . Dioscoridis . . . de Medica materia,* Venice, 1565, the caption was altered to "Hyoscyamus Niger."

"Some people," Mattioli wrote there, "have brought a certain new plant to Italy, really very beautiful to look at, which they include in the species Hyoscyamus. This puts forth half as many again stalks, round-branching, covered with fine down, and with wide, fat, soft leaves full of fine hair, bearing somewhat the appearance of soporific nightshade, but with a heavy odor. The flowers are yellow like Hyoscyamus. [Its color and parts are further briefly described.] It grows from a white root, a span in length, with numerous fibers on all sides, a finger-breadth thick . . ." (Translated from the original.)

It was not until 1570 that the first detailed account of tobacco and its medical uses and virtues was published. This appeared in Jean Liébault's edition of Charles Estienne's *L'Agriculture et Maison Rustique.* The name "Nicotiane" was first used here to honor the supposed introducer of the plant to France, Jean Nicot, French ambassador to Portugal. The plant is not illustrated in this edition, but the term attached to it became (with "tabaco" or its foreign equivalents) the most popular in texts dealing with the plant.

When Pierre Pena and Matthias de l'Obel collected the material for their *Stirpium Adversaria Nova,* London, 1570-1571, they were, apparently, unable to find in England a proper specimen of the tobacco plant they wished to illustrate. For the cut they employed is from an impression on a separate slip of paper, laid down—not printed on the pages in which they describe "Indorum sana Sancta sive Nicotiana Gallorum" (Holy healing [herb] of the Indians, or Nicotiana of the French). Although part of their text more properly relates to *N. rustica* than to *N. Tabacum,* the illustration is of the latter (var. *brasiliensis*) and it is the earliest published of the tobacco of commerce. After noticing that travellers returned from America "freshen their spirits by [sucking] in the smoke with their breath," they go on to say:

> "No proved harm is done to us by this yellow hyoscyamus, so truly called the *holy herb*, and its fame is now resounding everywhere. Our age has discovered nothing from the New World which will be numbered among the remedies more valuable and efficacious than this plant for sores, wounds, affections of the throat and chest, and the fever of the plague." (Translated from the original.)

The work which was to make tobacco a household remedy—and which supplied a nicotian gospel that inspired medical missionaries throughout Europe—was published by Nicolás Monardes at Seville, 1571. In his *Segunda Parte . . . de las . . . Indias Occidentales* (there is no mention of

In 1563 Mattioli captioned a picture of tobacco "III. Hyoscyamus."

tobacco in the prior editions of 1565 and 1569) Monardes presented an enthusiastic account of the medical properties he thought inherent to tobacco, and considerably expanded the list, given first by Liébault, of diseases it would invariably cure. His lengthy passage is illustrated with an unsatisfactory cut of *N. Tabacum* (either var. *havanensis* or *macrophylla*) which was seldom used thereafter.

"Indorum sana Sancta" or "Holy healing (herb) of the Indians" was the label attached to Pena and De l'Obel's illustration of what they called the "Nicotiana of the French," accompanied by a fanciful sketch of the way "Indians and sailors" smoked in the sixteenth century. This was the first published illustration of Nicotiana Tabacum.

An obscure author — one Jacques Gohory, who taught mathematics, dabbled in alchemy, astrology, and philosophy — published the first work devoted chiefly to the subject of tobacco, *Instruction sur l'herbe Petum . . .* Paris, 1572. In it, the shrewd author, having first obtained the approval of the Queen-Mother, Catherine de Medici, suggested that the wonder-working plant be called "Herbe de la Royne [Reine] ou Medicée," or "Caterinaire," or plain "Medicée." He seems, himself, not to have been too highly impressed with these suggestions, for throughout his text he used chiefly the Indian word "petum" (phonetic form of the Tupi-Guarani "pety," "pyty'ma"— perhaps an onomatope). The flattering names he had proposed were never popular, even in France, and soon held but an academic interest. Gohory

"Petum ou Medicée Femelle," according to Gohory, who had the "male" and "female" plants which he had grown in his garden illustrated by Baptiste Pelerin.

"Petum ou Medicée Masle" in Gohory's book.

announced that he had grown the two "sexes" of tobacco in his garden, and that he had had them portrayed by the "excellent artist" Baptiste Pelerin, for his work. Pelerin's "excellence" seems to have failed him, when it came to sketching the plants, for he produced two curiosities among illustrations of tobacco. Both are specimens of *N. Tabacum* (varieties unknown), the "female" having been developed from the seeds of the "male."

(For illustrations of the "male" and "female" types of tobacco, as portrayed by Pelerin for Gohory, see pages 223 and 224.)

A puzzling nomenclature had already been adopted to apply to only two species of tobacco in several varieties, and this department of classification was to become more involved. For the most part, however, *N. Tabacum* (var. *brasiliensis*) was generally referred to by the botanists as the "male," being the taller and more vigorous tobacco. That which developed from its seeds displayed the natural variations induced by new soil and climate and was usually designated the "female." This distinction was superficial, of course, depending upon the growth reaction of different varieties of *N. Tabacum*. The most common of the tobacco plants in this second classification was *N. Tabacum* var. *fruticosa*. *N. rustica* was awarded an extensive nomenclature, of which "Hyoscyamus luteus" (in relation to its yellow flowers) was most often employed by the early botanists. Most popular writers referred to it as the "third sort," and as "English tabacco" (from its wide cultivation then in England), though it, too, was occasionally classified as "female."

"Tabaco" as illustrated in 1571 by Monardes, who wrote effusively of its medical properties.

(Part II of "The Early Iconography of Tobacco" will appear in the November Journal.)

El Páramo de Sumapaz, Colombia

By F. R. Fosberg

THE term "páramo" means little to the average botanical reader. He has heard it used if he has talked with botanists who have visited Colombia or if he has read travel accounts of the country. To most Colombians it means a high, cold, inhospitable, wind-, rain-, and sleet-swept region. Botanists have attempted to use the term with various limitations. None of the definitions has become a part of the general terminology of vegetation students.

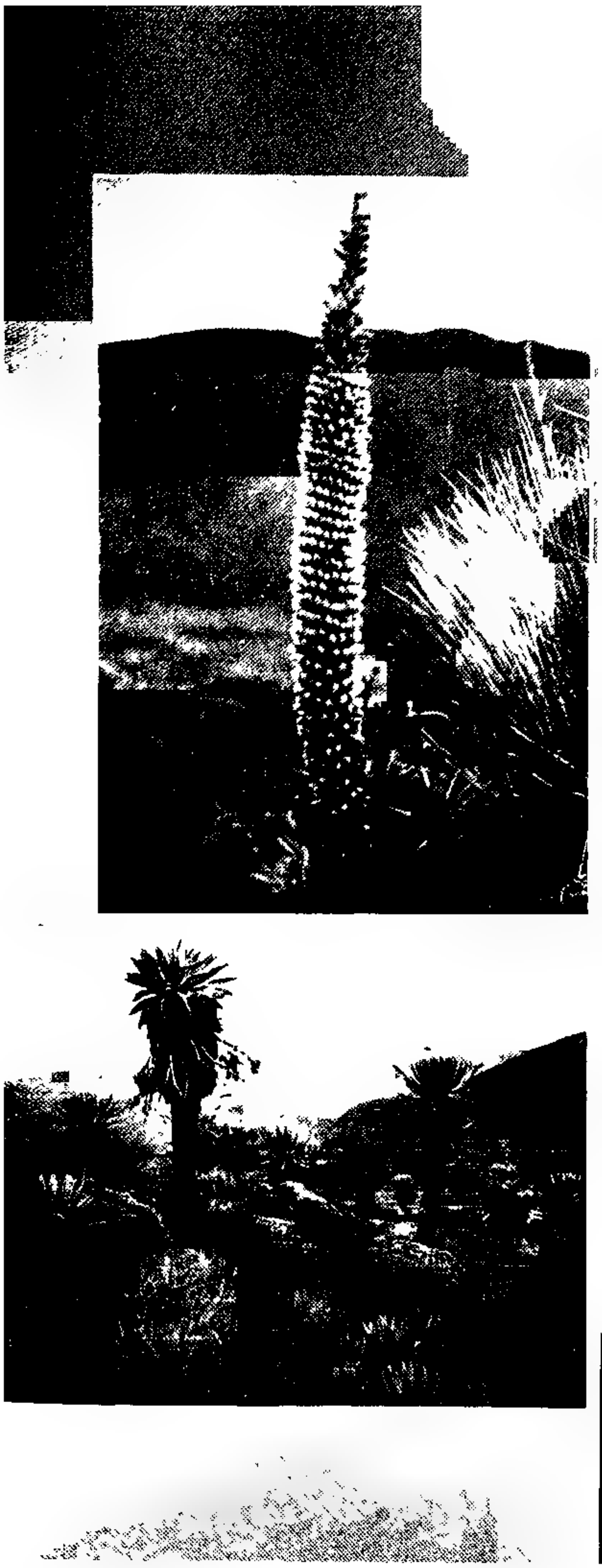
In line with the idea of using popular terms in ecology to represent as nearly as possible what they mean to the people of whose languages they are parts, it is suggested that the term páramo be used to designate that portion of the northern Andes which lies above the limit of forest, proper, and below the line of perpetual snow. This would correspond, roughly, with what the term means to the Colombians, although no two of them seem to have exactly the same idea of it.

I would divide this area into "páramo" and "subpáramo" ("paramillo") zones to correspond, roughly, with the upper, predominantly herbaceous vegetation belt, and the lower, predominantly shrubby belt. This seems justifiable on purely descriptive vegetational grounds, though, of course, there is no fixed boundary between them, just as there is no clear boundary between subpáramo and forest. Clearing, overgrazing, fire and other destructive agents have apparently greatly extended the subpáramo downward from its original 10,000 to 12,000 foot (3,200 to 3,700 meter) lower limit. This is probably due to the fact that páramo and subpáramo are early, though usually arrested, stages in a succession in a very wet climate such as prevails in high Colombia.

In any event, whether or not the terms have any true geo-botanical, plant-sociological, or phytogeographical significance interests me little. They are convenient designations for two types of vegetation with an aspect and floristic composition not duplicated elsewhere in the world or indicated by any other term, and of extraordinary beauty and interest. Of course, corresponding zones of dwarf vegetation exist at high altitudes on various tropical mountains. Geobotanists likely have invented or will invent a

PLANT LIFE ON THE PÁRAMOS OF COLOMBIA

Upper right: Páramo near Puracé, Cauca, in the southwest, at 3,300 meters, photographed last January by E. L. Core. This shows the type of páramo that lies in a depression surrounded by forest. Upper left: Lupinus alopecuroides, one of the noteworthy plants of the Páramo de Sumapaz, shown growing at 4,000 meters. Center right: Espeletia at 3,300 meters, on the subpáramo below the Páramo de Birolín, toward Duitama; photographed by Harold St. John. Lower left and right: Scenes on the Páramo de Sumapaz, south of the Colombian capital, showing different species of Espeletia growing at 4,000 meters, photographed by the author.



Explanation of pictures on the opposite page.

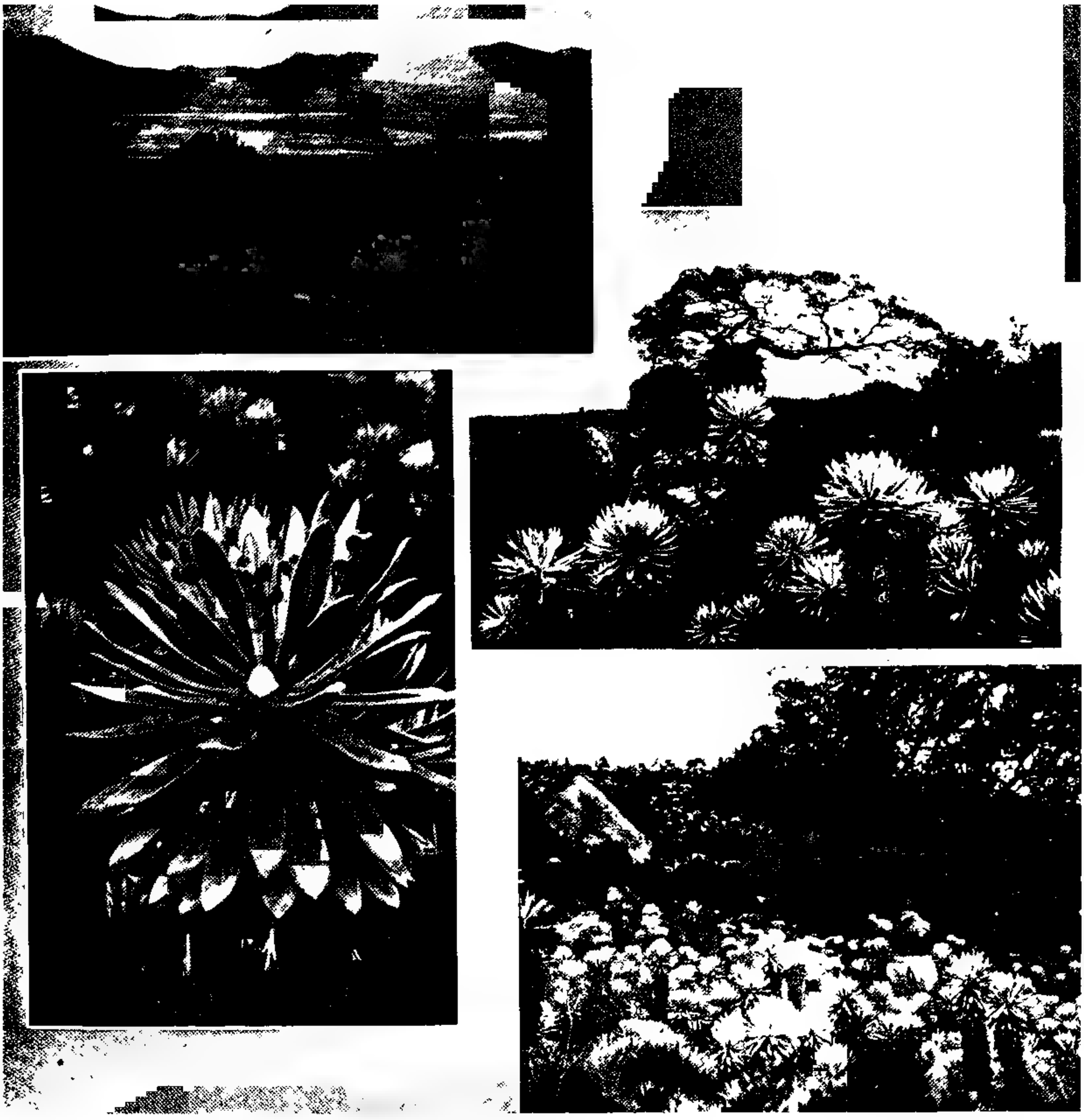
general term to include all of them. Páramo should likely be restricted to such regions from Costa Rica southward to Ecuador. It is said that the northernmost páramo is that on Cerro de la Muerte in Costa Rica and the southernmost somewhere in Ecuador. Certain writers have referred to páramo extending to various latitudes, even as far south as Chile. I have no experience south of Colombia, so cannot say what the southern limit is, but would suggest that it may correspond to that of the genus *Espeletia*.

Under the general name Páramo de Sumapaz is included an enormous expanse of high country from 3,000 to 4,500 meters or more in altitude, centering around the Nevado de Sumapaz, between the south end of the department of Cundinamarca and the Intendencia of Meta. It extends along the Cordillera Oriental, easternmost of the three great mountain chains of Colombia, for over 60 kilometers, from Oseras to El Hato, or even much further north, where it becomes the Páramo de Cruz Verde. Branch ridges extend in all directions. In some parts are evidences of former glaciation. Much of the high country is rolling, with high sharp ridges here and there, and many small lakes in the depressions. Many of the streams that radiate from the páramo originate in these lakes. This páramo separates the drainages of the Río Magdalena and the Río Orinoco, and the headwaters of the streams are so entwined that it is often difficult to tell which way the water is eventually going. Seeps and rivulets are everywhere, and in the rainy season much of the ground is saturated and marshy.

It must not be imagined that the boundary of the páramo is everywhere at 3,000 meters. This is, perhaps, below the limit of natural subpáramo vegetation. In places forest extends up to as much as 3,700 meters. One slope of a mountain will be densely wooded while another will be extreme páramo, the difference apparently depending on the exposure and history of the locality. Clearing and fire, at this altitude, are very likely to produce páramo vegetation. Patches of apparently natural páramo exist in depressions completely surrounded by forest. I suspect that temperature is an important deciding factor, since páramo vegetation exists in many sheltered places where wind could have little influence.

This páramo is burned over by the inhabitants every year in the dry season, so that the grass will produce new tender shoots which are more palatable for cattle than the older grass that is burned off. Therefore, it is difficult to tell what was its original condition. The destructive effects of Colombian "agriculture" thus extend even to such bleak and forbidding areas as the páramo! A few tiny potato farms are scattered here and there, even up as high as 3,700 meters. I have seen few livestock up here to benefit by such burning. Growth at this altitude is naturally very slow, so overgrazing would be easy. However, I noticed few evidences of it on this particular páramo.

The following description should be regarded as fitting only the páramo



EL PÁRAMO DE CONSUELO, BOYACÁ, IN CENTRAL COLOMBIA
Plants of Espeletia and other aspects of the vegetation are shown here as they appear at 3,450 meters elevation.
Photographs by F. R. Fosberg.

de Sumapaz, in its present burned condition, rather than páramos in general. The burning is doubtless the reason why the characteristic cushion-plants are here so small, and why grasses are so abundant.

The soil is thick, up to 3 decimeters, and very black. It is often so saturated with water as to be a soft mud, held in place by the roots of the plants. The páramo is basically a grassland with several kinds of stiff bunch-grass. These all form dense, hummock-like tufts, with stiff, harsh,

sharp, quill-like blades and occasional inflorescences. The bunches are spaced at an average of 4 or 5 decimeters apart. Another grass (*Chusquea Weberbaueri*) is locally abundant and conspicuous. It, too, is very stiff, but it usually forms colonies rather than bunches, and its blades are flat and lanceolate. It is not climbing like other species of its genus. In exposed situations it is low but erect, 6 or 8 decimeters tall when not in fruit, and in very unfavorable, it even fruits at 1 or 2 decimeters. Usually the spikes make it somewhat taller. In wetter places it becomes a meter or more tall, and in sheltered spots, it forms small cane-brakes up to 3 or 4 meters deep and very hard to push one's way through.

The most characteristic plant of the páramo is *Espeletia* or "frailejón" (literally translated "big friar" from the gray woolly coating). This curious genus of Compositae strangely resembles that other spectacular composite, the silver-sword (*Argyroxiphium*) of the high altitudes of Hawaii, but has many axillary inflorescences rather than a single terminal one. It is a rosette-plant, the large gray woolly rosettes usually topping a post-like stem, this composed of a pith, a woody cylinder, a softer outer cylinder, in all about 6-10 centimeters thick, surrounded by a coating as thick again of persistent leaf and inflorescence bases. The leaves are oblanceolate, spatulate, or oblong, very densely woolly or often silvery, and 2-3 decimeters long. The inflorescences form a ring, projecting outward or upward from the rosette, and sometimes becoming several times as long as the leaves and even more densely woolly. The flower heads are yellow, usually enveloped in the white or golden wool of the inflorescence, and are usually nodding. In the Páramo de Sumapaz are at least five perfectly distinct species of *Espeletia,* which can be told apart from a considerable distance. There are in fact, a multitude of species in the genus, some of them confined to a single páramo, others widespread. These plants are thickly scattered over practically the whole páramo, from one to several meters apart. They grow to a height of three meters at the most, but are usually from stemless to one meter tall. They contribute a strange and unearthly appearance to the páramo landscape.

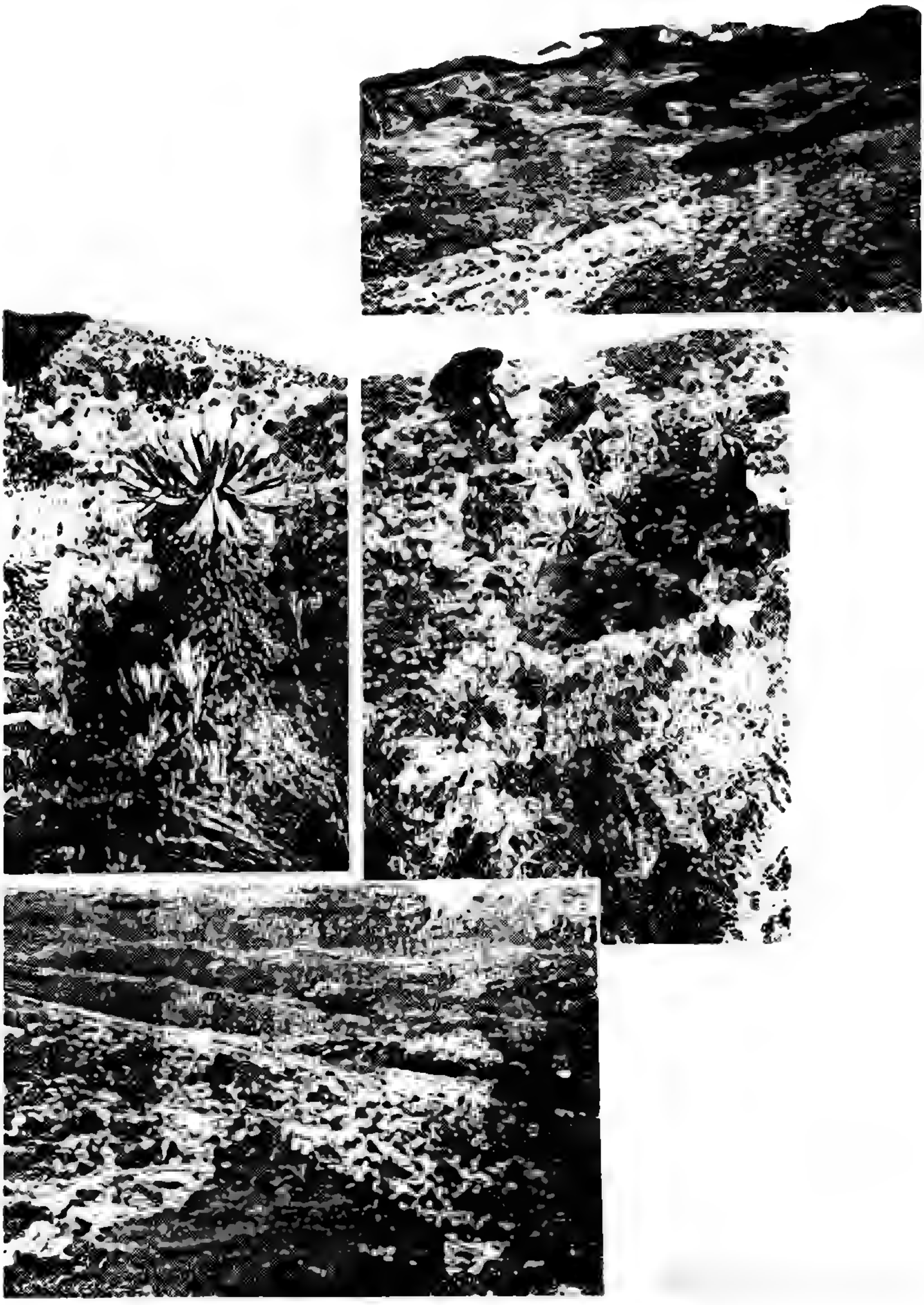
Other shrubby Compositae such as *Senecio, Baccharis,* and *Diplostephium,* are locally common. A species of *Gynoxys* (a *Senecio* with opposite leaves) with leaves shaped like those of *Buddleia* forms small patches of woods in sheltered valleys. These gray-green trees reach a height of 6 meters.

A shrubby *Hypericum* a half to two meters tall with tiny scaly juniper-like leaves is very common in most parts of this páramo. It has bright yellow flowers much larger than those of the other half dozen species of this genus that abound here.

Between the bunches of grass the ground is covered by mosses and various moss-like cushion-plants of which a mat-forming *Hedyotis* (*H. mutica*) is the most common. At a glance it resembles *Pyxidanthera,* the pyxie-

moss of the New Jersey Pine Barrens. It begins at about 3,500 meters altitude and is still common at 4,200 meters. Several geraniums, an *Oenothera,* a *Vaccinium,* and one or two other Ericaceae are prominent. More rare are several Compositae—a genus related to *Senecio* and several species of *Hypochaeris, Erigeron,* and others. A number of species of *Alchemilla* and several Umbelliferae also occur. One species of *Alchemilla,* a prostrate one, forms much of the ground-cover at high altitudes. A cushion-forming *Hypericum* is common and low hummocks or tufts of a tiny *Paepalanthus* (Eriocaulaceae) are seen everywhere. *Eryngium humile,* a queer little rosette-plant, is quite common here as in other páramos. Its heads of bluish-white flowers with white bracts are quite distinctive. More rare is a large prickly species of the same genus (*E. paniculatum*), which would at first sight be mistaken for a bromeliad. Castillejas of several species are common and conspicuous, and the related but inconspicuous *Bartsia* is more abundant here than I have seen it in any other páramo. Yellow-flowered sisyrinchiums and the related *Orthosanthus chimboracensis* with blue flowers are scattered over the slopes. The latter so resembles *Eccremis coarctata,* with which it grows, and *Dianella* of the south Pacific, both Liliaceae, that it makes one skeptical about the distinctness of Liliaceae and Iridaceae. Here and there are several sedges, *Carex* and *Rhynchospora.* From the subpáramo up to about 3,700 meters a stiff, upright species of *Hedyotis* (*H. nitida*) is very common. It is not seen at the higher altitudes, but here, very locally on high rocky ridges, is another species (*H. caracasana*), a handsome dark-green, rounded bush, box-like except for its tiny subimbricate narrow leaves and white flowers. Several species of *Lupinus* are locally common. Most of these are quite typical perennials, such as could have come from the home of lupines in the southwestern United States, though one has large magenta flowers. One other, however, *Lupinus alopecuroides,* is magnificent. It has a large thick stem, often decumbent and quite woody at the base, large dark green leaves, the bases with long white hairs, and a columnar inflorescence up to 8 decimeters tall, the whole resembling, from a distance, one of the great Canary Island species of *Echium.* The rachis is hollow and about 3 centimeters thick, and it bears flowers spirally as thickly as they can be set on this column. The whole is 6 or 8 centimeters thick. The flowers are violet with a pink wedge on the banner. Linear bracts project beyond the flowers. The fruiting inflorescence, crowded with silvery-silky pods about 2 centimeters long, is as spectacular as the flowering one, or more so.

The common sheep-sorrel, *Rumex acetosella,* forms red patches here and there over the whole páramo. Colonies of *Puya,* the striking páramo bromeliad, with great columnar spikes and pastel-colored flowers are common locally. In some areas the tree-fern, *Blechnum arboreum,* a cycad-like plant with a tall trunk and spreading sterile fronds, forms colonies. In other places a similar blechnum, perhaps a form of the same but acaulescent



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and with erect leaves, is common. A shrubby senecio with terete green leaves and yellow flowers is also abundant in many areas. *Aragoa,* one of the most curious of páramo plants, resembling a giant *Lycopodium,* but bearing white flowers and belonging to the Scrophulariaceae, is not common in the region, but at least one species is found locally.

In wet spots, seeps, springy places, and ravine-bottoms a different flora is found. Usually still present are the bunch grasses. Sedges are more abundant. Moss forms a deep, soft, wet turf. In this are many curious tiny plants of diverse families—Umbelliferae, Boraginaceae, Ranunculaceae, Compositae, and, apparently rarest of all, an *Isoëtes.* This, along with most of the others, is found in small open areas which are evidently filled-in pools—tiny bogs but lacking sphagnum. Only one plant of the *Isoëtes* was seen by me, completely immersed in the turf, appearing as a depression lined with stiff, thick, sharp quills. A white-flowered *Draba* and a green-flowered *Halcnia* are common in springy places, as is a *Stellaria* with leaves like salvinia which forms soft wet hummocks here and there. A *Castilleja* with four-sided spikes and scarlet, imbricate bracts presents occasional oriental-looking finger-like columns. An umbellifer with an odor exactly like celery but a low rosette plant is common on wet slopes. There also is one of the most curious things of all, an umbellifer (*Azorella arctioides*) which forms hard, round hummocks of tiny rosettes, but the masses are almost hollow inside, filled only with loose decayed leaves and radiating stems. Also forming hummocks, but very prickly ones, is a tiny juncaceous plant, *Distichia.* Perhaps most remarkable of all is a giant *Rumex* (*R. tolimensis*?), up to 2 meters tall, spreading by thick underground rhizomes. As the erect stems form long inflorescences with leaf-like bracts, the leaves below die, then the inflorescence itself matures and dies. Meanwhile other shoots are emerging, their leaves very large, with giant transparent filmy ocreas, or sheaths, the huge conical terminal bud covered by these and secreting great quantities of clear mucilage.

Shrubby senecios and other Compositae, as well as a number of striking-looking herbaceous Compositae—senecios with brilliant purple or yellow radiate heads and *Culcitium,* one of the woolliest of all plants, with great nodding rayless heads of flowers—are also found in these wet places.

Rock ledges and cliffs have several interesting plants—*Luzula,* a great *Draba* 6 decimeters tall, a bright yellow *Erysimum* (?), a stiff spiny *Escallonia,* a woody *Senecio* with round revolute leaves, and several ferns, such as a couple of species of *Asplenium,* one perhaps a form of *A. trichomanes,* a *Woodsia* or *Cystopteris,* two stiffly erect leathery species of

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EL PÁRAMO DE ALMORZADERO, SANTANDER, NORTH OF BOGOTÁ
At around 3,700 meters, these Espeletias and other plants occur.
Photographs by F. R. Fosberg.

Elaphoglossum, the acaulescent *Blechnum* mentioned above, and the curious *Jamesonia,* with its erect, delicate, unnatural looking fronds, narrowed and curled over at the tip.

The lower páramo and subpáramo slopes, below the páramo, proper – a sort of transition to the forest below—present a curious superficial resemblance to the "heath balds" of the southern Appalachians. An abundance of ericaceous shrubs--*Gaultheria, Pernettya, Disterigma, Befaria, Thibaudia, Vaccinium*, and others not recognized, add to this aspect. However, a great variety of Melastomaceae of all sizes and colors, most of them strikingly beautiful, the usual shrubby composites, shrubby hypericums, and *Muhlenbeckia* would be amazing, indeed, on a heath bald. This vegetation, greatly extended by destruction of the forests, but in its turn being destroyed by cultivation and grazing, is one of the most colorful in the tropics. There is always a profusion of flowers in bloom. The páramo region as a whole is a gigantic flower garden, or rather a rock garden. It is to be hoped that at least some of it may be spared for future botanists and plant lovers to see.

The rough draft of this was written while the author was marooned for several days on the Páramo de Sumapaz. Unfortunately a large part of the specimens collected on this trip were destroyed. Hence the lack of names for many of the species mentioned. F. R. F.

BROADCAST

By Mrs. Mortimer J. Fox

VEGETABLES and herbs which are little known today but which might well be grown in American gardens and served on American dinner tables were described by Mrs. Mortimer J. Fox in the Garden's broadcast over station WNYC *August* 11. *The material was taken largely from chapters in Mrs. Fox's book of* 1943: *"Gardening for Good Eating." Some of the plants she mentioned are briefly described in her own words here.*

Lovage

Tasting like celery but a little heavier is lovage (*Levisticum officinale*), a herb indispensable to soups and salads. The plant is closely related to celery, but is perennial and comes up early in April. The leaves can be picked all summer and fall until black frost. It grows three feet high and is lush with its many erect celery-like leaves. The stalks can be cooked as a vegetable in early spring, but later in the season their taste becomes too strong to use except in small quantities as a condiment.

Cardoon

Cardoon (*Cynara Cardunculus*) is a beautiful plant, closely related to artichoke and with much the same flavor, only in cardoon it is the leaf-stalks and midrib that are eaten and not the unopened flower buds as in artichokes. The huge grey thistle-like leaves are so handsome they can be used in flower arrangements. The plants should be spaced about three feet apart, and when they are fairly high, soil is hilled around them to make the leaves more tender. In fall, before frost, the plants are lifted, taken indoors into a cool place, and buried in sand to be used whenever wanted all winter. The

seeds are listed in most catalogs, but somehow I've never come across cardoons in a market.

Comfrey and Borage

I cannot praise comfrey (*Symphytum officinale*) highly enough. It is perennial and from early April until after frost the leaves can be cut and cooked as a green. They are slightly rough to the touch but lose this in cooking, and have a faint flavor of cucumber. In cooking comfrey, I boil it in an open kettle and change the water about three times to prevent bitterness. After they have been cooked, the leaves are chopped and mixed with cream sauce, and when served even the children eat this form of "spinach" with relish. Sometimes comfrey is mixed with borage, but each is also used alone.

Borage (*Borago officinalis*) is handsome enough for the flower garden, with its panicles of blue star-shaped flowers. It withstands the hottest days of summer and when spinach has run to seed, it furnishes a good substitute.

Skirrets

Skirrets (*Sium Sisarum*) are a root vegetable, and the plants are handsome with feather-divided leaves and fine sprays of white flowers. In fall, the thick clumps of roots are lifted, divided, and boiled. They have a distinctive flavor and, moreover, they are perennial, so a few roots can always be put back into the garden to live and multiply another summer. Queen Elizabeth was said to be fond of skirrets.

Caraway Roots

I certainly recommend eating the roots of caraway (*Carum Carvi*), for they have a delightful taste. However, it is a mistake to grow too many novelties at one time. Two, or at most three, new vegetables a year are enough to undertake. If they thrive and if the family likes them, they can become permanent on the list of plants to be grown.

Rampion

The campanula known as rampion (*Campanula Rapunculus*) would be a very popular vegetable if it were better known. Unfortunately, the seed is scarce. Moreover, it is tiny and must be sown in a protected seed-bed, very early in spring, and later transplanted to the garden. Rampion is biennial, so it rarely flowers the first summer. The leaves have a delicate flavor and can be eaten raw in salads. They stand cutting frequently during the season. By the end of the first summer the roots are large enough to cook. They have a pleasant flavor.

* * *

Among other food and flavoring plants that Mrs. Fox mentioned in her talk were samphire, angelica, burnet, seakale, Jerusalem artichoke, and the prairie potato, Psoralea esculenta.

Notices and Reviews of Recent Books

(All publications mentioned here may be consulted in the Library of The New York Botanical Garden or may be purchased on order through the Library.)

Good Sense in House-Plant Culture

ENJOY YOUR HOUSE PLANTS. Dorothy H. Jenkins & Helen Van Pelt Wilson. 238 pages, illustrations, glossary, index. Barrows, New York, 1944. $2.50.

This book is heartily recommended. It is simple, straightforward. practical, and should be a help to anyone, novice or experienced amateur, who wishes to grow flowers in the house.

Especially pleasing is the suggestion that plants should not be held over from sentiment after they have passed their usefulness. Far too many of us cherish hopeless creatures, straggly, long-armed and forlorn, because some beloved friend gave them to us or we bought them in an interesting place. Perhaps the advice given so kindly and firmly here will harden a few hearts, so that the ugly survivors may no longer take up valuable space.

A particularly useful list is that of vines with the special exposures indicated which would be most likely to give them the conditions they need. A list for all the plants named would have been better yet, though the best exposure is shown in the description of each plant.

Ways of using one's windows are given with many suggestions for increasing space. Many plants, common and uncommon, are named, with cultural directions. Horticultural practices are good. There is even a glossary. The matter of resting plants, so little considered by amateurs, is emphasized and propagation by cuttings explained. There is a plea for better plants in churches, and the ever-problematic African violet has a section all to itself.

Just one small doubt creeps into this song of praise. If these two busy ladies do with their own hands all the watering recommended (sometimes twice daily) and all the removing of these plants for a bath under a faucet to remove mealy bugs and aphids and "sichlike" and a shower once a week or oftener, when do they eat and sleep?

SARAH V. COOMBS.

Dust to Dust . . . And Organic Matter to Earth

THE LIVING SOIL. E. B. Balfour. 248 pages, illustrated, indexed. Faber & Faber, Ltd., London. 1943. 12/6.

A most interesting book, wherein the author conducts a vigorous crusade in furtherance of the cause of building a "living soil." This effort is not directed solely towards methods of soil treatment and the building up of the humus content whereby the evils of erosion originating in erroneous principles are overcome, but also to a particular system by which the living organisms of the soil, both animal and plant, are maintained to the utmost.

It is also Eve Balfour's contention that the health of the human race is continuously impaired through malnutrition, the result of eating food produced from land impoverished of these soil organisms. She goes further even and states that the re-introduction of proper soil-building practices would in time eliminate many of the diseases that man and the domestic animals are heir to.

"This ever recurring cycle of birth, growth, reproduction, death, decay, passing once more into birth is often called the wheel of life." . . . "Out of the earth are we and the plants and animals that feed us created and made, and to the earth we must return the things whereof we are made if it is to yield again foods of a quality suited to our needs."

The method advanced by the author of this work to produce the soil condition advocated, is neither new nor startling, and I venture to suggest that it will be accepted by all as logical.

A considerable part of the text is interspersed with quotations from various publications on the study of nutrition and soil fertility and presents a condensed summary of much scientific research in these directions. Naturally. the bulk of this quoted material is in support of the theory advanced, and the author has presented an intriguing case.

Written for the layman, without overmuch technical and scientific detail, this book is pleasant reading, convincing, and well worth the serious consideration of any one interested, and this vital topic should be the concern of all.

EDWIN BECKETT.

Guide for Growers

MODERN FARMERS' CYCLOPEDIA OF AGRICULTURE. Earley Vernon Wilcox. 497 pages, illustrated, indexed. Orange Judd Publishing Co., New York. 1944. $4.50.

In compiling this Cyclopedia of Agriculture, the author has succeeded well. In such a broad field as agriculture each topic has to be treated briefly. Possibly no single book on the subject contains so much information conveniently arranged and concisely written. It could be a useful reference for established farmers, but even more so for inexperienced persons with agricultural ambitions.

The sections on vegetables, fruits, soils and fertilizers, should be useful to the army of Victory Gardeners having limited time. Consideration is given to the fundamentals of growing beans, parsnips, peaches, strawberries, the propagation of rhubarb and grapes, how to graft fruit trees and combat the many diseases and pests, to mention only a few items. One may wish to seek more detailed information but Wilcox makes a start.

Many photographs and some drawings illustrate the book. The planting guide and tables in the appendix are particularly useful. The table of contents makes it easy to find any subject which one wishes to read independently of others.

This treatment of general agriculture with considerable emphasis on fruits and vegetables should prove valuable to many people at this time. Anyone calling himself a horticulturist would find the book a useful addition to his agricultural library, although he would want much more complete information on many subjects.

NORMAN H. FOOTE,
State Institute of Agriculture, Farmingdale, L. I., N. Y.

Eliminating Insects

PEST CONTROL IN THE HOME GARDEN. Louis Pyenson. 190 pages, illustrated, indexed. Macmillan, New York, 1944. $2.

Dr. Louis Pyenson is the first to consolidate in one small volume the great wealth of information on pest control in the home garden. This concise discussion of the subject will, no doubt, receive a wide and hearty reception by the thousands of garden enthusiasts throughout the country.

The author has ably organized the subject matter and has emphasized the fundamentals of pest control throughout the book. Preventive measures, crop rotation, cultural practices and hand picking are stressed, while chemical control is considered lightly, and rightly so, because many chemical insecticides and fungicides are scarce during the war period and, too, the recommendations for these materials are constantly changing from year to year.

The excellent illustrations plus the concise descriptions should make diagnosis of the pest in question quite simple for the gardener.

The author's advice about getting information on unsolved garden problems is well worth the price of the book. Too few gardeners realize that there are such sources of free information and service.

Every owner of a copy of "Pest Control in the Home Garden" should feel indebted to Dr. Pyenson for the great service he has rendered.

BAILEY B. PEPPER,
Dept. of Entomology, New Jersey State Agricultural Experiment Station.

Botany and Big Business In Grapefruit, Lemon, And Orange Culture

THE CITRUS INDUSTRY, Vol. I. Edited by Herbert J. Weber & Leon D. Batchelor. 1028 pages, bibliography, illustrations, index. University of California Press, Berkeley and Los Angeles, 1943. $7.50.

Among fruit growing industries, citrus (orange, grapefruit, lemon) ranks high in volume of fruit produced, and this work in its detail and scope measures up to the magnitude of citrus culture.

Volume I, the first of three, is divided into ten sections, each handled by a specialist who has had long contact with his particular part of the field. These sections deal with History and Development of the Citrus Industry; Plant Characteristics and Climatology; Commercial Citrus Regions of the World; Botany of Citrus and its Wild Relatives; Cultivated Varieties of Citrus; General Morphology, Histology and Physiology; Mineral Nutrition of Citrus; Seed Reproduction; Genetics and Breeding; Bud Variation and Bud Selection.

This volume is especially valuable to research workers, teachers, students, and growers of citrus fruits. The exhaustive section on citrus and citrus relatives' botany alone covers pages 129-474; the bibliography is very extended.

This and subsequent volumes in the series as they appear are highly recommended for all those interested in citrus fruits. The preparation represents a tremendous amount of research and downright hard work.

H. HAROLD HUME,
University of Florida.

Virus Report

PLANT VIRUSES AND VIRUS DISEASES. F. C. Bawden. Second edition, 294 pages, 48 illustrations, bibliography, index Chronica Botanica Co., Waltham, Mass. 1943. $4.75.

The author deals almost entirely with those viruses that have received the most intensive studies. Many viruses are not mentioned, and some are discussed very briefly.

The 16 chapters are developed chiefly around methods and problems—that is, introduction, symptomatology (external and internal), transmission, relations between viruses and their insect vectors,

strains, mutation and acquired immunity, serological reactions, methods of purification, properties, inactivation, size of viruses, physiology of host, classification of viruses, control, and a discussion on origin and multiplication.

Even though relatively few viruses are taken up, the subject matter covered is very extensive. In the 284 pages of text some subjects could receive only brief consideration or none at all. As in the first edition, the major emphasis is placed on biochemical and physical studies. Here, the author has made his chief contributions, and is well qualified to deal with the several related subjects. It is of particular interest that he does not take the position that the viruses are definitely non-living chemical entities.

The author deserves high commendation for assembling much valuable information and for presenting it in a manner that should stimulate a critical viewpoint among virologists.

H. H. McKINNEY,
U. S. Bureau of Plant Industry Station, Beltsville, Md.

H. M. Denslow

THE LAST remaining charter member of the Torrey Botanical Club, which was formally organized in 1867, died at the age of 92 in Hartford, Conn., September 7. He was Rev. Herbert McKenzie Denslow, who for many years had been closely associated with the New York Botanical Garden through his active interest in plant life. From 1922 to 1932 he was Honorary Custodian of the Local Herbarium.

Native orchids were Dr. Denslow's hobby, and he studied and published rather extensively on them, particularly after his retirement from teaching in 1923. His work has appeared in *Addisonia*, in the Journal of the New York Botanical Garden, and particularly in *Torreya*, among other periodicals.

Dr. Denslow was born in Massachusetts August 20, 1852. With his uncle, an ardent amateur botanist, he was one of the first to join the Torrey Botanical Club when it was formally established in 1867, and attended meetings regularly whenever he was in or near New York. He was graduated from Yale in 1873, received an A. M. degree from Kenyon College in 1896, and D. D. from the General Theological Seminary in New York in 1907. Five years after his graduation from Yale he became a deacon and in 1879 a priest in the Protestant Episcopal church. In 1902, after 24 years of preaching in eastern states, he was appointed a professor in the General Theological Seminary, where he taught until he became Professor Emeritus in 1923.

In 1942, on the occasion of his 90th birthday and the 75th anniversary of the Torrey Botanical Club, the Bulletin of the club published a portrait of Dr. Denslow with a brief biographical sketch written by Dr. John Hendley Barnhart.

Storm Damage

THE HURRICANE which reached New York the evening of Sept. 14 caused the loss of 135 large trees at the New York Botanical Garden, besides 50 or 60 saplings. Among them were some of the oldest and largest trees on the grounds, several specimens measuring up to four feet in diameter and 100 feet in height.

Oak trees suffered the greatest damage. Hickory, hemlock, ash, and maple trees also were lost in large numbers, the majority of them native trees which had been on the grounds since before the existence of the Garden. Except for a few which were snapped off, they were mostly uprooted, and many of them showed a very shallow rooting system, spread out thinly over the rocks which dominate this area.

In the arboretum there was also considerable damage, about 100 trees being affected, but there the majority of the specimens could be straightened or pruned, and repairs on most of them have been completed already. Only about a dozen were completely uprooted (these included three Colorado blue spruces near the conservatories), and the majority of these were not rare specimens.

The work of removing and cutting the fallen trees, it is estimated, will continue steadily until spring. As many as possible of the large sound trunks will be utilized for lumber. Other wood felled by the hurricane will be used for burning in the furnaces.

Notes, News, and Comment

Jubilee. Felicitations on the 75th birthday and the 50th anniversary of the scientific activities of Vladimar Komarov, President of the Academy of Sciences in Moscow, were cabled abroad by Dr. William J. Robbins in advance of the celebration to be held there Oct. 14. Announcement of the jubilee came to the New York Botanical Garden by cable from Nicolas Bruevich, Secretary of the Academy. "May the co-operation of the U.S.A. and the U.S.S.R. be continued through long years of peace," Dr. Robbins concluded his message.

A.A.A.S. At the Cleveland meeting of the American Association for the Advancement of Science Sept. 11-16, Dr. William J. Robbins spoke as retiring vice-president of the section on botanical sciences on "The Importance of Plants." The paper, which was presented before a joint meeting of several botanical societies, will be published in *Science,* and portions of it will appear in an early number of this Journal. At the dinner for all botanists, Dr. Robbins spoke as retiring president of the Botanical Society of America on "The Future of Plant Physiology."

Dr. Frances E. Wynne gave a paper on "Studies in *Calliergon*" Sept. 12. The following day, Dr. Margaret Fulford, who was returning to the University of Cincinnati after completing a summer of research at the New York Botanical Garden on the Marshall A. Howe Memorial Fellowship, spoke on "The Field in Tropical American Hepaticae." Dr. and Mrs. F. J. Seaver attended the meetings, also Mrs. Annette Hervey and Dr. E. H. Fulling.

Visitors. Following the Cleveland meetings of the A.A.A.S., several scientists paid visits to the New York Botanical Garden before returning home. Among them were Harlan K. Pratt of the California Institute of Technology, who was interested in the Garden's work on vitamins and *Neurospora*, and E. L. Tatum of Stanford University, who is concerned with the production of rubber from guayule.

R. T. Clausen of Cornell University spent the last half of the month working on the Leguminosae in the Garden's herbarium. Other visitors of recent weeks have included Mel T. Cook of the University of Louisiana; S. G. Wildman of the U.S.D.A., who is working on rubber problems; Antoinette Miele Wilkinson of Cornell; Frank E. Egler of the University of California and New York City; Rupert C. Barneby of Wappingers Falls, N. Y., working on *Astragalus;* J. E. McClary of Anheuser-Busch Co., St. Louis; Benjamin N. Duggar of Lederle Laboratories, Pearl River, N. J.; Alex Finlay of Charles Pfizer & Co., Brooklyn; Gertrude S. Burlingham, Winter Park, Fla., investigating some fungi; Mary F. Barrett, Montclair, N. J., doing research on *Ficus;* Mario Ferri, University of São Paulo, Brazil, accompanied by T. Dobzhansky of Columbia University; Lt. and Mrs. T. Wayne Porter, Oak Harbor, Ohio; and E. T. Chandler of Sussex and W. J. Sims of Surrey, England, two young gardeners who are serving with the R.A.F. and who made the New York Botanical Garden one of their main objectives when they reached New York.

Gardening School. Wilson Popenoe has been named director of a School of Pan-American Agriculture being inaugurated this month at Zamorano, Honduras, by the United Fruit Co. Run on a workshop basis, the school will provide training in the planting and management of home gardens and truck gardens and instruction in the nutritional value of the common vegetables.

Elizabeth Billings. The sister-in-law of the late President Frederic S. Lee of the New York Botanical Garden, Elizabeth Billings, died in September at her home in Woodstock, Vt. She had long been actively interested in the Botanical Garden, and had become a Fellow for Life in 1913.

How to Prevent Cankerworm Damage

A Seasonable Warning for Tree-Owners

By Louis Pyenson,
State Institute of Agriculture
Farmingdale, Long Island

CANKERWORMS—or inchworms, as they are commonly known—caused serious defoliation to our shade trees this past spring. They are likely to do so again unless measures are taken to prevent the wingless female moths from crawling up the tree trunks to deposit their eggs on the branches and twigs.

The wingless female of the fall canker'worm emerges from the soil after freezing weather has occurred, usually in November and December; while the spring cankerworm emerges in late February and during March and April.

The most efficient material to use around tree trunks as a barrier to the cankerworms is a sticky substance known as "tree tanglefoot." It should be obtainable in any horticultural supply house. Or, if preferred, a home-made mixture may be prepared by mixing five pounds of resin and three pints of castor oil.

First, an eight-inch band of fairly heavy paper is tied—or better, wired—around the tree. Any crevices beneath the paper must be stopped with cotton. Then a sticky band of tanglefoot is spread on the heavy paper. Tanglefoot should never be applied directly to the bark, as injury to the tree will result.

The bands should be placed around the trees in early October for the fall cankerworms and should be renewed, if necessary, in late February to catch the spring cankerworms as they climb up the trees.

The bands must be watched to see that a bridge is not formed across them by the winged males which may alight and stick there or by the masses of females crawling up the tree.

Dr. Pyenson is the author of "Pest Control in the Home Garden," recently published by Macmillan and being reviewed in this month's Journal.

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To reach the Botanical Garden, take the Independent Subway to Bedford Park Blvd. station; use the Bedford Park Blvd. exit and walk east. Or take the Third Avenue Elevated to the Bronx Park or the 200th St. station, or the New York Central to the Botanical Garden station.

PUBLICATIONS OF THE NEW YORK BOTANICAL GARDEN

Books, Booklets, and Special Numbers of the Journal

An Illustrated Flora of the Northern United States and Canada, by Nathaniel Lord Britton and Addison Brown. Three volumes, giving descriptions and illustrations of 4,666 species. Second edition, reprinted. $13.50.

Flora of the Prairies and Plains of Central North America, by P. A. Rydberg 969 pages and 601 figures. 1932. Price, $5.50 postpaid.

Plants of the Vicinity of New York, by H. A. Gleason. 284 pages, illustrated A handbook especially compiled for the beginner in plant identification. 1935. $1.65.

North American Cariceae, by Kenneth K. Mackenzie, containing 539 plates of *Carex* and related plants by Harry C. Creutzburg, with a description of each species. Indexed. 1940. Two volumes, 10¾ x 13½ inches; bound $17.50; unbound $15.50.

Keys to the North American Species of Carex by K. K. Mackenzie. From Vol. 19, Part 1, of *North American Flora*. $1.25.

Plants of the Holy Scriptures by Eleanor King, illustrated, and accompanied by a list of Plants of the Bible with quotations, in the March 1941 Journal. 15 cents.

Food and Drug Plants of the North American Indian. Two illustrated articles by Marion A. & G. L. Wittrock in the Journal for March 1942. 15 cents.

Vegetables and Fruits for the Home Garden. Four authoritative articles reprinted from the Journal, 21 pages, illustrated. Edited by Carol H. Woodward. 1941. 15 cents.

The Flora of the Unicorn Tapestries by E. J. Alexander and Carol H. Woodward. 28 pages, illustrated with photographs and drawings; bound with paper. 1941. 25 cents.

An Herbal. First published by Richard Banckes in London. 1525. Edited and transcribed into modern English with an introduction by Sanford V. Larkey, M.D., and Thomas Pyles. 200 pages, including facsimile of original. Prepared by Scholars' Facsimiles and Reprints. 1941. Price to members of the Garden, $2.50; to others, $3.50.

Catalog of Hardy Trees and Shrubs. A list of the woody plants being grown outdoors at the New York Botanical Garden in 1942, in 127 pages with notes, a map, and 20 illustrations. 75 cents.

Succulent Plants of New and Old World Deserts by E. J. Alexander. 64 pages, indexed. 350 species treated, 100 illustrated. Bound in paper. 1942. Second edition 1944. 50 cents.

Periodicals

Addisonia, annually, devoted exclusively to colored plates accompanied by popular descriptions of flowering plants; eight plates in each number, thirty-two in each volume. Now in its twenty-second volume. Subscription price, $10 a volume (four years). Not offered in exchange. Free to members of the Garden.

Journal of The New York Botanical Garden, monthly, containing news, book reviews, and non-technical articles on botany and horticulture. Subscription, $1 a year; single copies 15 cents. Free to members of the Garden. Now in its 45th volume.

Mycologia, bimonthly, illustrated in color and otherwise; devoted to fungi, including lichens, containing technical articles and news and notes of general interest. $7 a year; single copies $1.50 each. Now in its thirty-sixth volume. Twenty-four Year Index volume $3.

Brittonia. A series of botanical papers published in co-operation with the American Society of Plant Taxonomists. Subscription price, $5 a volume. Now in its fifth volume.

North American Flora. Descriptions of the wild plants of North America, including Greenland, the West Indies, and Central America. 100 parts now issued. Not offered in exchange. Prices of the separate parts on request.

Contributions from The New York Botanical Garden. A series of technical papers reprinted from journals other than the above. 25 cents each, $5 a volume.

Memoirs of The New York Botanical Garden. A collection of scientific papers. Contents and prices on request.

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CAROL H. WOODWARD, Editor

BY-PRODUCT OF PLANT EXPLORATION

Third in a series of editorials designed to show the unique and specialized services that are furnished to the public without cost by the New York Botanical Garden

ONE of the important functions of a botanical garden is to explore areas of the world where the plants are not yet well known; there are still large sections of the earth which have been insufficiently studied.

The purposes of such exploration are diverse. Plants new to science may be discovered; so, of first interest, botanically, is the determination of what kinds of plants grow in the area, then what is their distribution and relative abundance. At the same time observations are made on the uses of native plants by the local inhabitants.

Sometimes exploration is directed toward specific objectives such as the location of natural stands of trees producing economic crops—rubber, quinine, balsa-wood, chicle; sometimes a search will be made for varieties of a specific plant wanted for a breeding project. Another time attention will be given to a study of the growth habits and reproduction of certain plants in their natural habitats; often, seeds and other living parts of plants are collected for introduction into cultivation. In the course of this work the botanical explorer naturally becomes familiar with the geography of the country, and it is this sort of knowledge which has proved to be of unique importance.

Shortly after the outbreak of war we were visited by a representative of the Office of War Information. He was looking for data on certain portions of another continent—data on rivers and streams, mountains, swamps, types of vegetation, and other geographical items of strategic importance. He had had relatively little success through the customary channels. We put him in touch with a member of our staff who had collected extensively in the area concerned. All the available information was placed at the disposal of the government investigator, including maps of the area which had been prepared by our staff member on the basis of his own experience.

We have no way of knowing how useful this source was We can only judge by the profuse expressions of appreciation and his description of the sources we had made available as "a gold mine of information."

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American Arnica in Medicine

By George M. Hocking*

WHENEVER liniment appears, arnica comes to mind, for liniment without arnica flowers would, to many people, scarcely be worthy of the name. In fact, rubs and similar preparations containing arnica have proved so popular with the public that pharmaceutical manufacturers think it unwise to offer a substitute for the crude drug which is considered the most valuable ingredient—arnica flowers.

The important uses of arnica today are still mostly those which were displayed in the title of a pamphlet published a century ago by Charles Julius Hempel: "A treatise on the use of arnica, in cases of contusions, wounds, sprains, lacerations of the solids [1] (*sic*), concussions, paralysis, rheumatism, soreness of the nipples, etc., etc. . . . New York City, 1845." The wide usage of arnica in former times in an even greater number of diseases and conditions is manifest from one of the common names formerly applied to this drug—"panacea."

Arnica flowers as a product used to be imported from countries in the mountainous parts of continental Europe where the plant grows wild. Arnica root and arnica leaf also are much used abroad, but are not popular in the United States, though the root apparently is occasionally used, since a price is quoted for it. However, neither root nor leaf appears to be collected here or at present imported. The flower, which in normal times here cost slightly less than the root, now commands a figure about four and one-half times that of the European product in 1939.

Arnica flowers from Europe originate exclusively with *Arnica montana,* its varieties and forms, since this is the only wild-growing species naturally distributed in the collection areas of that continent, and it is the species which is official in nearly all the pharmacopoeias of the world. Tschirch [2] indicates that *A. alpina* may occasionally be used like *A. montana,* but it

* Dr. Hocking is Pharmacognosist for S. B. Penick & Company, New York.

[1] "Soft solids of the body"—a solid part or constituent of the body, e.g., eye balls, muscles, etc. Term commonly used one to two centuries ago; now rarely seen.

[2] Tschirch, A., Handbuch der Pharmakognosie, II²: 1183. 1917.

occurs only in Lapland and in the extreme north of the Russian Soviet Republic, well away from the usual collecting regions.

Soon after war came and with it the decline in shipping from Europe, American arnica flowers appeared on the market, and it seems likely that they will successfully replace the European species, at least until overseas shipping is resumed on a normal basis.

Precise identification of the flowers of American species of *Arnica* in use is not as easy as for the imported. This is because so many different kinds occur in North America (regarded as the natural home of the genus), with all but two of the 32 known established species occurring on this continent.[3] In the Rocky Mountains, the ranges of the various species largely overlap and even in the same meadow colonies of different ones freely and frequently intermingle, it is said.

Various American species from the western states and Canada have been used successfully during the last three or four years. Pharmaceutical manufacturers seem agreed that the tinctures, fluidextracts, and other preparations made from domestic arnica are in value comparable to those prepared from *A. montana,* although as yet no careful physiological, pharmacological, toxicological, or clinical studies have been published.[4] Because of the needs for arnica and the shortness of supplies from European sources, other species besides *A. montana* have been permitted as official by the National Formulary VII (the other chief official American compilation of medicinal materials besides the U. S. Pharmacopoeia).

Samples of domestic arnica flowers obtained from various commercial collections have been examined for identity. With only the capitulum (sometimes with a small piece of attached peduncle) available for study, the following species were determined as accurately as this was possible:[5]

Species found	*Frequency* (number of lots noted)
Arnica fulgens (prairie arnica)	14
A. sororia	16
A. mollis	1
A. Rydbergii	1
Total lots examined	32

Other species (including *A. Chamissonis* and *A. cordifolia*) have been reported, but these were not seen by the writer.

Incidentally, Tschirch [6] mentions as "parallel drugs" the two American species *A. Chamissonis* and *A. acaulis,* but because the latter is not

[3] Maguire, Bassett. A Monograph of the Genus Arnica. *Brittonia,* 4:(1943). 386-510. Other botanical data in this paper were obtained from this monograph.

[4] Although desirable, such data are not strictly necessary in view of the type of usage made of arnica in this country.

[5] Acknowledgment is here gratefully made of the kind assistance of Mr. Edward J. Alexander and Dr. Bassett Maguire, both of the New York Botanical Garden, in the identification of specimens.

[6] *Ibid.*, p. 1183.

abundant, it seems unlikely that it ever will be regularly collected, although it is the only species indigenous to the eastern states. *A. cordifolia* is said to have been largely collected in British Columbia in 1942. This species is abundant in some localities and possesses large capitula. Because they grow at such high altitudes, it seems unlikely that some species (such as *A. Rydbergii*) will ever be important commercial articles.

The American *Arnica* species which are collected are only distantly related to *A. montana,* although the erroneous names applied by some of the older writers would, if accepted, tie them closely.[7]

Collection of arnica is carried out during the blooming period (summer) in high regions of the Rocky Mountain states, where the plants grow rather commonly in alpine meadows. The flower-heads are cut off close to the involucres [8] and collected in such handy receptacles as buckets and gunny sacks. They are then dried, preferably in the shade, such as in an abandoned or little used building or an attic, where they are left to stand for about a week, occasionally being turned over to ensure thorough desiccation. Then the drug commonly is left to dry for a day or so in the open, frequently strewn on canvas. The article should then be "crisp dry." One pound of the drug is prepared from 5½ pounds of the "green" flowers.

For shipping, the most popular containers appear to be wool bags (large bags about six feet long, ordinarily used for wool), 50-pound flour sacks (which contain about eight pounds of arnica flowers when stuffed), and burlap sacks. Whatever packing means come to hand nowadays must of necessity be used; consequently we find arnica coming in bales, cartons, boxes, etc. In normal times, the European arnica flowers were brought into the country in sacks of about 100 to 200 pounds weight, and in bales, both loose and pressed, weighing up to 300 pounds or more.

Labor difficulties have become greater and greater, so that during the present year most collections were made by children and women, together with a few older men. These pickers are paid very attractive returns under current conditions.

The American arnica now marketed is a definitely cleaner and brighter looking article than the European as formerly received here; and, as would be expected, it is considerably fresher, because it reaches its market so much sooner.

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[7] Thus, *A. fulgens* Pursh has as synonym *A. montana fulgens* Nutt.; it does not, of course, follow that Nuttall's interpretation of the species is correct even though by the custom of taxonomists his name is recorded as synonymous. Actually, *A. fulgens* belongs to Subgenus (I) *Arctica* Maguire, which group also includes the other American species in use today; whereas the official *A. montana* is placed in the quite distinctive Subgenus (IV) *Montana* Maguire. The only other species classified as closely related to *A. montana* is *A. acaulis,* which, as noted above, has no commercial possibilities.

[8] In Europe, two articles are known: *Arnic. Flores cum Receptaculis* ("*cum Pappis*") and *Arnic. Flores sine Receptaculis* ("*sine Pappis*"), the latter consisting of the flowers separated from the receptacle. Only the former item is known in the United States.

Arnica has frequently been reported as adulterated: thus, Hegi [9] lists eighteen species of plants used intentionally or unintentionally to adulterate arnica flowers; additional ones are named by Tschirch and others. The flowers so used are nearly always species of Compositae, with yellow ray-flowers. Thus, the flower-heads of *Inula britannica* are occasionally observed.[10] In Latin America, many plants have been called "arnica," and this has led to considerable confusion.[11]

Several adulterants or sophisticants have been noted by the writer. Thus, from Mexico, *Heterotheca inuloides* is frequently offered either as "Arnica (del Pais)" or sometimes even under its proper botanical name, since it is a native drug with useful properties in its own right. In one instance, a lot of so-called "arnica flowers" imported from Mexico was found to consist of a mixture of capitula of *Lebetina porophyllum* (a relative of the marigold) and *Heterotheca inuloides,* with the former predominating. From Peru were received samples of one or more species of *Senecio* labeled as "Flores de Arnica con Hojas"; also from Peru came "Arnica Flores: *Senecio pseudotites.*"

In one instance, an offering of "arnica flowers granulated" proved to be a finely shredded wood.

A number of popular misconceptions and exaggerated theories have grown up about arnica. Thus, years ago it was believed in medical circles that the therapeutic action of arnica flowers originated in the insects commonly infesting this drug. This was later disproved.

Another false notion is that arnica plants are poisonous. No doubt this originated from the popular association of medicinal and toxic properties. As a matter of fact, arnica plants despite their value as drugs are not classed among plants poisonous to stock. So far as is known, all American species of *Arnica* may be eaten by live-stock with impunity, the flower-heads being preferred in grazing to other parts of the plant. Some species have fair value as forage plants.[12]

From this brief review, it appears that American species of arnica have proved to be excellent substitutes for the European. Apparently *Arnica fulgens* and *A. sororia* furnish most of our commercial drug as now on the market.

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[9] Hegi, Gustav. Illustrierte Flora von Mitteleuropa **6**[2]: 707-9. Munich. n.d. (*ca.* 1928).

[10] U. S. D. A., Bur. Chem., SRA No. 20:57. 1917.

[11] Martinez, Maximino: Catálogo de Nombres Vulgares y Científicos de Plantas Mexicanas. Mexico, D. F. 1937. This work lists 9 "arnicas," none of which is of the genus *Arnica.*

[12] Nelson, S. B. (Wash. State), U. S. D. A., Bur. Animal Ind., Bull. 22:10-14, 1898.—Range Plant Handbook. U. S. D. A., Forest Serv., p. 222, 1937.—Personal communication, Pathological Division, Bur. Anim. Ind., March 22, 1944.

Aftermath of Robot Bombs

In England's Gardens

THE flying bombs which wreaked such havoc in England during the summer affected gardens as well as buildings and human lives. And they have had their effect on the spirit of some British gardeners too. The article directly below, which appeared in an August number of the LONDON DAILY MAIL, *comes to the New York Botanical Garden through the courtesy of the British Information Services in New York. The subsequent article is reprinted from the August issue of* THE GUILD GARDENER, *which is received each month by the Botanical Garden's Library. Lady Seton is Honorary Editor of this periodical and apparently is the author of the opening editorial, part of which is presented here.*

From The London Daily Mail

GARDENING experts and botanists are puzzled by the second spring which flying bombs brought to one area of Southern England.

Blast and the havoc the doodlebugs cause have, in effect, started trees growing again, and promise to produce autumn fruit in the depths of winter.

In the gardens of wrecked houses in one devastated area are trees which had been almost uprooted when the buildings were destroyed.

An apple tree which when the bomb fell a month ago was laden with ripening fruit lay bent across what had once been a vegetable garden.

A lilac tree was straggling over an Anderson shelter.

Both trees had been stripped of all their leaves and the apples scattered. Today the trees are decked in spring blossom.

There is abundant white lilac, which usually grows in April and May but has never been recorded in August in England. There is leaf and pink and white blossom on the crazily-tilted apple tree.

Horticulturists cannot explain this strange blast effect. The Royal Botanic Society are considering an investigation of the phenomenon.

An official of the Royal Horticultural Society had to be convinced by photographs. "All I can say is that it is extremely interesting," he said. "So far as I know, such a thing has never happened before."

The only theory on this rebirth of the trees is that the effect of the blast is in some way akin to the "summer pruning" of fruit trees.

A gardening expert said that there are two forms of sap in trees—"fruit" and "foliage."

His explanation is that when the trees lost their leaves the fruit sap became operative and produced the blossom on the apple tree.

At the same time the sap which produces the flowers on the lilac tree was also stirred to activity.

The Guild Gardener Editor Writes:

YOU will remember that in the piping days of peace we always gave you a holiday number in August. Well I feel in a holiday mood to-day (although I have not been out of London for over three years) and shall attempt to spread the feeling through the *Guild Gardener.*

First, I want to tell you a little about how we live in London. It is 39 days since I, or most others, have been in bed, or have undressed except

Lilacs in England in August, after the plants had been stripped by robot bombs, as illustrated by the London Daily Mail.

to bathe. We all sleep in the oddest places—basements, in cupboards, under tables, in garages—anywhere that flying bomb blast and splintered glass is unlikely to get us.

Our sleep is continually punctuated by the crash of these bombs. I have counted 10 in 10 minutes, though we often have long intervals. I will say no more about them as people with imagination will know what we are taking, and people without it couldn't realize.

After the night comes mercifully the long, busy day. My plan is to work all the morning till I am hot and tired and then lie down in a lovely cold bath to rest. This is where my holiday starts. I try hard to fancy the smell of the sea. I roll about and think the waves I make are breaking on golden sands. Then out to the garden which is either a disgrace or a delight, according to your temperament. For years it has had no care as I have an allotment which takes all the time I can spare. But in these years the plants have settled down to what pleased themselves. Every rock plant lover will know that I have lost all my rarer treasures, but all the more one appreciates a pool of royal blue (*Gentiana lagodechiana*), a carpet of snow-white thyme, the strange fleshy spikes of sempervivum, a gay spread of Mr. Hayward's Highland pinks, a variety of *Iris pumila* and a few more stalwarts. But for a rock garden it is disconcerting to see a whole forest of green teasels, over 5 feet high whose parents came from Shannon banks, and who must have spent last autumn shedding what seed the goldfinches did not eat.

A great drift of mauve (*Geranium pratense*) carries me back to many happy holidays in Upper Teesdale where my husband fished for tiny trout while I wandered after the rarest and most beautiful flora of the British Isles, or together we watched the ways of birds which never visit us in London. Ravens, golden plover, gray and yellow wagtails, ring ousels, snipe, curlew, gold-crested wrens, dippers, and many another. . . .

Today one thinks with yearning of lazy hot afternoons drifting slowly on sluggish Thames waters, watching dragonflies darting in and out of those stately weeds that flourish in southern streams—purple loosestrife, foaming masses of meadowsweet, and greens of every shade among the feathery grasses. How one aches at times for the stillness, the scents, the peace—the sense that nothing mattered, that time had gone to sleep. Shall we ever find *that* again? . . .

The Early Iconography of Tobacco

By Jerome E. Brooks

II.

(*Part I appeared in the Journal for October*)

AMONG the best of the earliest illustrations of tobacco are the two which appear in Dodoens' *Purgantium* . . . 1574 (before referred to). One, under "Hyoscyamus luteus" has already been mentioned. The other is captioned "Hyoscyamus Peruvianus"—a misnomer long attached to the plant. In describing the latter, which the author compares to "H. luteus," he remarked that it comes "from the provinces of America which they call the West Indies, among which is the kingdom of Peru." But, as a reliable author (though known only by his initials, C. T.) observed in 1620, Peruvian tobacco had never been seen in Europe. (Several species of *Nicotiana* are indigenous to Peru, but these were not smoked there, nor exported.)

The work in which Thevet disputed the use of "Nicotiana" as a generic term for tobacco, on the ground that he was its original importer into France, was his *La Cosmographie Universelle,* Paris, 1575. In this he names the plant "l'herbe Angoulmoisine [Angoulême]" after his birthplace, where he had sown the seeds. The cut which illustrates his text contains a fantastic conception of native cigars. The tips of the plant's leaves seem characteristic of *N. Tabacum*

Nicotiana Tabacum var. brasiliensis is represented by this cut of "Hyoscyamus Peruvianus" or "henbane of Peru" which appeared in 1574 in Dodoens' "Purgantium."

"L'herbe Angoulmoisine" pictured here by Thevet (who named the plant after his native town of Angoulême) should represent Nicotiana Tabacum, seeds of which Thevet had brought to France from Brazil, but the likeness is remote. The illustration, published in Paris in 1575 in his "La Cosmographie Universelle," shows his conception of a group of Brazilian smokers.

(var. *brasiliensis*) but the variety portrayed here cannot be identified. The controversy between Thevet (who inspired no following) and the adherents of Nicot for the credit of first importation of tobacco into France was finally settled in our own day. The solution seems almost too simple: Thevet had brought in the seeds of *N. Tabacum* from Brazil; Nicot had sent in from Portugal the seeds of *N. rustica* which had been received from Florida!

The nicotian gospels of Liébault and Monardes were translated into English by John Frampton, whose edition (London, 1577) became widely popular and was frequently reprinted. Frampton employed the cut first used by Pena and De l'Obel, but here the negro head and cigar were excluded. De l'Escluse embellished the second Latin edition of his work of 1574 (before referred to), the *Simplicium Medicamentorum,* Antwerp,

1579, with two illustrations: the first the "H. Peruvianus" from Dodoens, 1574, but here captioned "Petum Latifolium;" the second a picture of *N. Tabacum,* either *fruticosa* or *angustifolia,* under the heading "Petum Angustifolium." The latter had been published by De l'Obel in his *Plantarum seu stirpium icones,* 1576, titled "Herba Sancta, sive Tabacum minus"—an illustration often employed.

De l'Escluse (Clusius) in 1579 used this picture of Nicotiana Tabacum from De l'Obel's work of three years earlier calling it "Petum Angustifolium."

Cardinal Prospero di Santa Croce, papal nuncio at Lisbon, is supposed to have brought tobacco seeds into Italy, about 1561. The species he introduced was certainly *N. rustica,* then well known in Portugal. But when Castore Durante published his *Herbario Novo* at Venice, 1585, he illustrated his account of the plant, which he called "Herba Santa Croce," with a variety of *N. Tabacum.* This is regarded, by the best authorities today, as a representation of one of the numerous crosses between *N. Tabacum* var. *brasiliensis* and var. *havanense.* The tendency, on the whole, is towards the *havanense* type of *N. Tabacum.*

Joachim Camerarius, in his abridged edition of Mattioli, *De Plantis Epitome Utilissima,* Frankfort-on-the-Main, 1586, added to scientific knowledge of the plant by first

The "Herba Santa Croce" published by Castore Durante in Venice in 1585 represents one of the numerous crosses between varieties of Nicotiana Tabacum.

The first illustration of the parts of the flower of tobacco —calyx, corolla, seed-pod, and seeds—appears with a representation of a plant of Nicotiana Tabacum var. brasiliensis, published under the name of "Hyoscyamus Peruvianus" in 1586 by Camerarius in his abridged edition of Mattioli's work on useful plants.

displaying various parts (seed-pod, corolla, etc.) of tobacco in his representation of *N. Tabacum* var. *brasiliensis.*

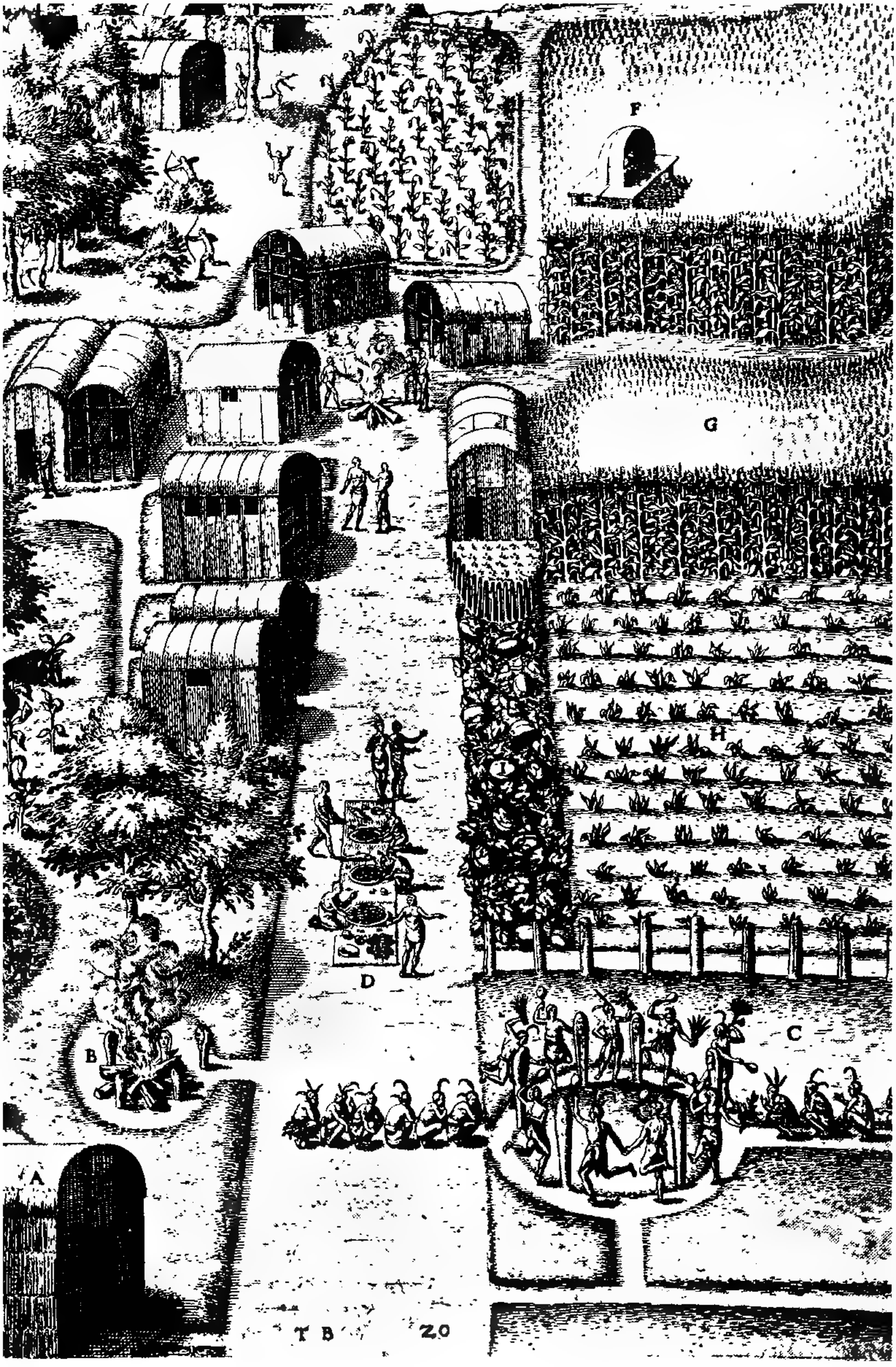
A portion of a tobacco plantation in an Indian village is for the first time pictured in De Bry's edition of Thomas Hariot's *A Briefe . . . Report of the new found land of Virginia,* in Part I of his *Grands Voyages,* Frankfort, 1590. Here the plant is shown under cultivation, in an "uppówoc" garden, "uppówoc" being the familiar Indian word for tobacco among the Virginia tribes and their relatives.

None of the other sixteenth century illustrations employed for tobacco appear to be originals. In his famous *Herball,* 1597, Gerard made use of familiar cuts, as did contemporary European botanists. The primary pictures of tobacco in European works of the sixteenth century have, therefore, been recorded in this article. Many of these illustrations were identically reproduced in popular works, where a printer had access to the original block; some were re-engraved and occasionally embellished. With the exception of the plate in Hariot, which is from copper, all the others are from wood-blocks. Few of the artists are known. The confusion in classification, as indicated in this paper, continued until Linnaeus revolutionized the system of plant nomenclature in his *Species Plantarum,* 1753.

While it was planned to confine this paper to the illustrations of tobacco in the sixteenth century, the reader will excuse a brief excursion into the next period for the sake of some curiosa of our subject. The 1602 edition of the translation, from De l'Escluse, of the works of various authors, entitled *Histoire des Drogues . . .* contains a long passage on tobacco. Two unusual representations of the plant appear therein. One, "Nicotiane ou Tabaco" is of a variety of *N. Tabacum* (probably *brasiliensis*); the other, "Nicotiane petite des Indes" may be *N. rustica* var. *texana.* But Professor Setchell stated, in reply to a query, that he had never seen such a combination as is here illustrated, for while the leaves represent a variety of *N. rustica,* the flowers are those of *N. Tabacum.* The cut was, however, undoubtedly intended to represent the former.

What appears to be the earliest attempt at morphological analysis of tobacco occurs in Theodore Schoon's compact but encyclopedic work on medicinal herbs, plants, etc. *Waare Oeffening . . . der Planten,* The Hague, 1692. Here occurs a striking illustration, apparently the first such published—the skeletal structure of a specimen of *N. Tabacum* var. *brasili-*

On the opposite page is shown an "uppówoc" garden of the Indians in Virginia, as recorded by Thomas Hariot, tutor and adviser of Sir Walter Raleigh. "Uppówoc" was the local name for tobacco, which was being grown in the two sections of the plan marked "E."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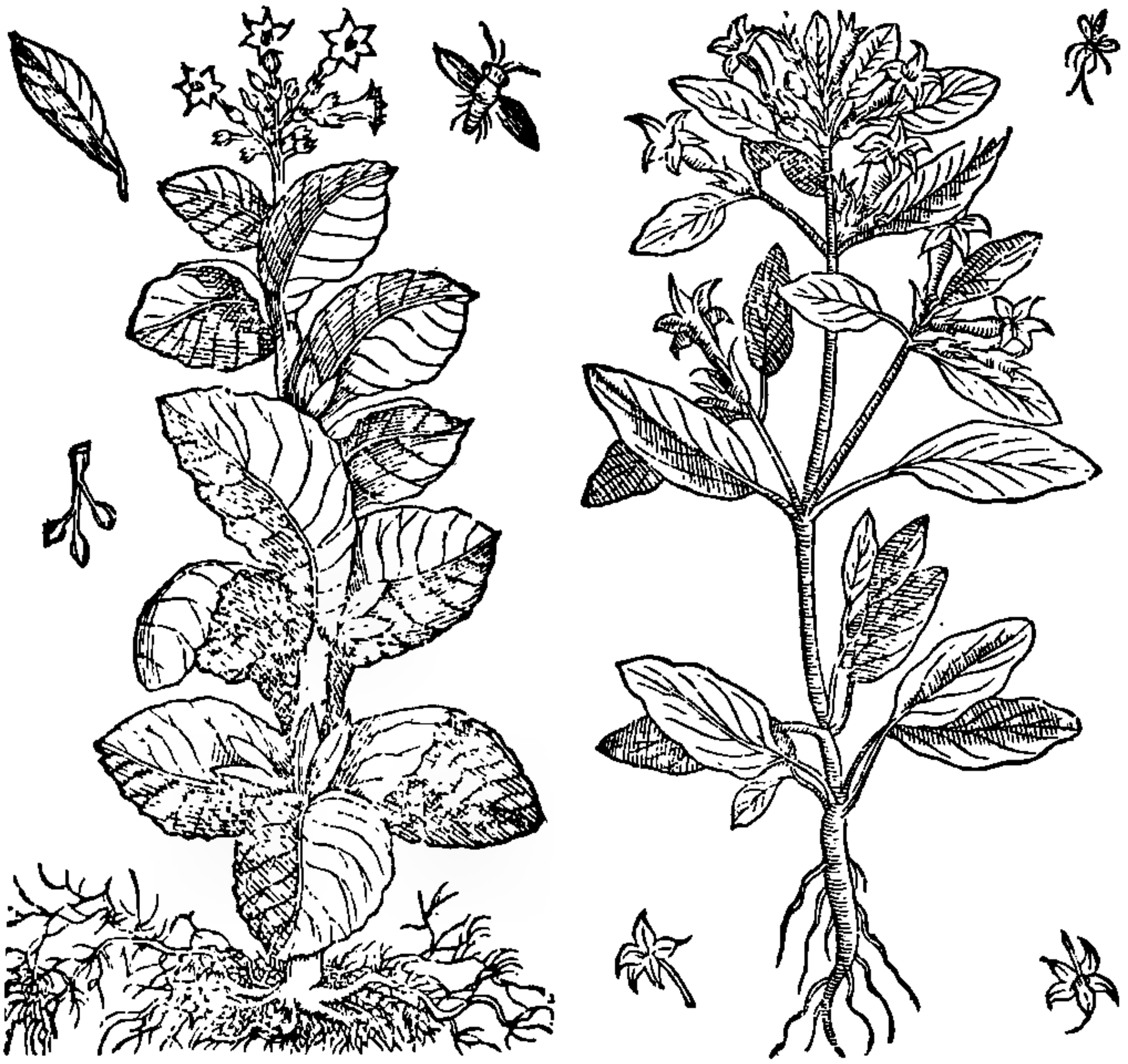
In a Dutch work on medicinal herbs at the end of the 17th century appears the first attempt to portray the skeleton of the tobacco plant.



Nicotiana Tabacum and N. rustica are supposedly represented in these two illustrations taken from the 1602 edition of the French translation of De l'Escluse's compilation on the history of drugs. "Nicotiane ou Tabaco" is the title of the picture at the left, showing N. Tabacum. The one at the right, the leaves of which resemble N. rustica, is called "Nicotiane des Indes."

ensis. It is labelled by the author "Tabacum majus mas latifolium." It has a unique place in the iconography of tobacco, being the prototype of modern X-rays of the plant.

Note: All of the books referred to (except the Durante of 1585) *are in the library of tobacco gathered by George Arents, who is a member of the Corporation of the New York Botanical Garden, and the illustrations are from these works. The quotations given and the facts reported all occur in Tobacco, Its History illustrated by the Books, Manuscripts and Engravings in the library of George Arents . . by Jerome E. Brooks (New York,* 1937, 1938, 1941, 1943).

Vegetable Dyes of Ancient Usage

By William F. Leggett

II. Safflower, the False Saffron

EVERY worthy product has a substitute. Even among the coloring materials used in early days, dyes of inferior value were foisted on the market, often made from plants bearing no relation whatever to the genuine source of the dye. While safflower had a considerable vogue of its own, it also appeared on the medieval market as a substitute for or an adulterant of saffron, particularly when saffron was used for shades of red. Though its name suggests this role of substitute, the word safflower is not derived from the word saffron, but rather both names come, by a devious route, from an Arabic word for yellow—color of the flower of the one and of the principal dye produced by the other.

The safflower, *Carthamus tinctorius,* a prickly plant, is an annual belonging to the Thistle family. The characteristic heads of flowers consist of many yellow or orange florets, and it is from these that the dye is obtained. The florets are carefully picked by hand when they reach full bloom, and are thoroughly dried in the sun. The resulting orange-colored fibrous mass is the dye material. Another method of obtaining the dye is by first kneading the florets in water in order to remove the

Flowers of the safflower (Carthamus tinctorius) from the herb border at the New York Botanical Garden this year. These plants grew about two feet high and flowered in July. By August 1 they were almost completely dried up.

fugitive yellow coloring matter. Then the reddish-yellow material is pressed into cakes preliminary to packing in two-hundred-pound bales for market.

The dye principle is an insoluble red substance, small in content, but capable of fixing the soluble yellow content to at least 30 percent. In the presence of various acids and alkalies, it transmits yellow, orange, red, and various shades of pink. It is, however, a very weak dyeing agent, since it requires from four ounces to one pound of extract per pound of fabric to be dyed, to obtain shades of color ranging from pink to crimson.

The safflower plant is believed to have originated in southern Asia, and is known to have been cultivated in China, India, Persia, and Egypt almost from prehistoric days, where its earliest use was for food and medicine. There are numerous references showing that for many centuries the Chinese used safflower to obtain rose, scarlet, purple, and violet shades on silk, and we are told that Egyptians used it to secure a brilliant scarlet on linen. The culture of safflower was gradually extended from Egypt to the Mediterranean area long before the Roman era, but it seems to have been well known to the ancient Greeks, who used its seeds for a purgative.† The Greeks were aware of the medicinal properties of the seeds of the safflower, and at one time adopted the safflower as an official emblem.

The safflower plant was cultivated in Italy, France, and Spain during the Middle Ages, and soon after the discovery of America the Spanish government directed that the plant be cultivated in Mexico and in that portion of Spanish South America now known as Venezuela and Colombia.

The merchants of northern Europe probably obtained the safflower dye either from Florence or Genoa, where by the end of the twelfth century the art of dyeing had attained world-wide importance. An English recipe of 1583 A. D. states: "Yee shall take one pound of saufleure and let it soke halfe a day. . . ."

The rapid abandonment of safflower dye, despite the beauty of its colors, was due not only to its evanescent quality, but also to the time and expense involved in the process of growing, gathering, and airing the florets, and extracting the dye element. Today, safflower is rarely used in Europe, but large quantities are still cultivated for local use in India.

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† An oil of commercial value is derived from its seeds today.

Notices and Reviews of Recent Books

(All publications mentioned here may be consulted in the Library of The New York Botanical Garden or may be purchased on order through the Library.)

An English Artist Turns To the American Scene

GIVE US THIS DAY. Clare Leighton. 86 pages, illustrated by author. Reynal & Hitchcock, New York. 1943. $2.50.

Clare Leighton describes in a most delightful style the simple, everyday things that make America great. This book is essentially her impressions of a new land, with detailed descriptions of the infinite varieties of people and their occupations. Much emphasis is placed upon the good earth, and the battle for the repioneering of the land, as well as the spirit of man. The soil becomes something to cherish and the life of the farmer becomes the greatest happiness.

The author, well known to America for her woodcuts of the English scene, has for the first time illustrated aspects of farm and countryside in America, with ten chalk sketches and end-papers.

"America is corn," writes Miss Leighton, and symbolically, her title page illustration shows a sprouting kernel of corn.

The drawings are excellent and well reproduced. The book is recommended for an evening of comfortable reading.

E. E. NAYLOR.

Aid for Altar Guilds

FLOWER ARRANGEMENT IN THE CHURCH. Katharine Morrison McClinton. 105 pages, illustrated. Morehouse-Gorham, New York, 1944. $1.50.

This book will have its uses for members of Altar Guilds and other persons working around a church. Much of the material has been assembled from consultation with authorities on such matters. The lack of a glossary is a serious fault. Even those used to church nomenclature might wonder what a riddel is or a gradine, and not everyone understands what is meant by a retable or a superfrontal.

Interesting insertions are the Sarum and the Western Rites, these being old lists showing the colors to be used throughout the year by those following such a succession. Probably the Western Rite is the one most commonly used here in churches of the United States.

The flower arrangements are pleasant if not outstanding. Blue is recommended as a color for flowers in a church. A somewhat comprehensive experience has taught this reviewer that in a dim chancel, blue, unless it is so light as to be almost white, simply melts into the background and is seen no more. And where, oh! where, in the eastern states, may one buy blue agapanthus and white for adorning the altar—or for any other purpose?

The subject is an interesting one, dating back as it does to age-old rites and customs. Tracing some of these to their origins in old monkish literature or early manuscripts would be a fascinating occupation.

SARAH V. COOMBS.

Vitamins and Enzymes

ADVANCES IN ENZYMOLOGY. Edited by F. F. Nord and C. H. Werkman. Vol. 4. 332 pages, author and subject index, bibliography. Interscience Publishers, New York. 1944. $5.50

This is the fourth annual volume of reviews of the chemistry of enzymes and vitamins. This volume, like the others, covers a wide range of subjects, some of which are of direct interest to the plant physiologist.

The "Chemical Formulation of Gene Structure and Gene Action" by Addison Gulick gives a biochemist's idea of the protein chemistry and physics involved in gene structure and action. The author refers to 227 publications, most of which appeared within the last six years.

The review by W. W. Pigman is of the work done in the last decade on the "Specificity, Classification, and Mechanism of Action of the Glycosidases."

R. D. Hotchkiss reviews the work done on the production, purification, and mode of action of the antibiotics gramicidin

and tyrocidine. Tyrosinase is discussed by J. N. Nelson and C. R. Dawson. Other reviews are: "Biological Energy Transformations and the Cancer Problem" by V. R. Potter, "The Transamination Reaction" by R. H. Herbst, "Influence of Hormones on Enzymatic Reactions" by H. Jensen and L. E. Tenenbaum, and the "Absorption Spectra of Vitamins, Hormones, and Enzymes" by W. R. Brode.

F. W. KAVANAGH.

New Methods in Cytology

FRONTIERS IN CYTOCHEMISTRY. Edited by Normand L. Hoerr. 334 pages, illustrated. Jaques Cattell Press. Lancaster, Pa. 1943. $3.50.

This book brings together information obtained by some of the new methods of studying cytology to show the promise and limitations of the methods. The contributors are outstanding in, or have created their respective fields; the presentation is as simple as is compatible with the subject. Literature citations are extensive but seem to be well selected. People working directly in the field will probably want copies of the book; most others will be content to use the library copy.

The format of the book, especially its wasteful use of space for literature cited, struck me as bad taste for a wartime publication.

VIRGENE W. KAVANAGH.

New Jersey's Peatlands

THE PEATS OF NEW JERSEY AND THEIR UTILIZATION. Selman E. Waksman and others. Bulletin 55, Part B, Geologic Series, N. J. Dept. of Conservation and Development. 278 pages, maps, charts, photographs, bibliography, index. Trenton, N. J., 1943.

A detailed survey of the peat bogs of New Jersey — their location and size, their botany and chemistry, and their possible utilization—is given in this concluding number of the report begun in 1938 in co-operation with the N. J. Agricultural Experiment Station, Rutgers University, and with the aid of the Work Projects Administration. More extended use of the state's half million acres of peat land are recommended in the final chapter, and methods of getting the benefit of these areas are suggested.

CAROL H. WOODWARD.

BROADCAST

By E. E. Naylor

EFFECTS of a season of sunshine and rain on an acre of corn were described by Dr. E. E. Naylor in the Botanical Garden's bi-weekly broadcast over station WNYC *August 25. Some of the facts which were stated by the speaker are given here.*

AN ACRE of corn will absorb about 400,000 gallons of water in a growing season of 100 days. This is in Illinois, where the farmers grow about 10,000 plants to the acre. That means that each plant takes in at least 40 gallons, or about four quarts a day on an average—more, of course, at the peak of the season.

This water comes from rain. The average rainfall for that section of the country is from 30 to 40 inches annually. It is generally assumed that about one-third of this runs off as it falls, another third drains through the soil to the watertable underneath, and only the last third remains immediately available for the growth of the plants. Four hundred thousand gallons would cover an acre of ground to the depth of 15 inches.

What Happens to the Water?

This water is drawn into the plant through the root hairs, from which it passes into the roots and from there, by an efficient system of channels, up the stem and into all the leaves. With it, it carries minute quantities of mineral matter that is essential to the growth of the plant. This mineral matter—iron, potassium, phosphorus, magnesium, and such—is of course completely dissolved in the water. As this solution moves through the plant, the leaves become so saturated that they are constantly losing water. Nobody sees it escaping, for it passes through microscopic openings, like tiny sliding doors, in the surface of the leaves, and goes off as an invisible vapor.

Food Factories

You know, of course, that green plants, such as corn, are in a way small factories —food factories. That is, when sunshine is present, they turn out a product, and

that product is sugar. The sunshine takes the place of the hydro-electric power of a man-built factory. It provides the energy by which the manufacturing process is performed.

The raw materials are two of the simplest, commonest things in the world: carbon dioxide and water.

The only evidence you have of the sugar manufactured in the corn plant is in the sweetness of the grain when you eat it. The rest of it is converted, in turn, into other substances. Most important of these is starch, which is a substance closely related to sugar. The food value of many plants (potatoes, for instance) is derived from the starch they store. And all this starch at one time was sugar in the cells of the plant.

Fats are likewise made, and proteins also are manufactured within the corn plant, these with the help of the minerals that have been drawn up in solution with the rain water from the soil.

Then about half of the sugar that is made in the leaves of the corn is converted into cellulose for the framework of the plant.

How Much Sugar?

Plant physiologists, in some of their early experiments, have shown how much sugar is formed in a given leaf area over a specific length of time. Under favorable conditions—that is, in the presence of full sunlight and with ample water supplied from the roots—the leaves that would cover a square meter of surface if they were laid side by side would make *one gram of sugar in one hour of time.* A square meter is a little larger than the top of a card table and a gram of sugar is a little less than one teaspoonful. This is manufactured in one hour. So, if we assume a ten-hour average day of sunlight and a growing season of 100 days, we find that a corn plant would make about two pounds of sugar in a season. If you multiply two pounds by the 10,000 plants that would be growing in a midwestern acre of corn, you would have 20,000 pounds, or 10 tons. A farmer raising 40 acres of corn would be manufacturing 400 tons of sugar.

But only a small portion of this is saved to give flavor to the corn on the cob and sweetness to the stalks in the silo. Many things happen to this sugar while the plant is growing. Perhaps well over a third of it is used to supply energy to the growing corn plants themselves. That is, at least 150 of the 400 tons from a 40-acre planting would be dissipated in growth. Another 200 tons or more is consumed by the growing plants in building up their cellulose framework. And that leaves barely 50 tons for people and animals to enjoy.

Energy for Mankind

If you have not thought what that 50 tons will do, consider first that man must have energy, and there is only one fundamental available source for it. Energy must come from the foods we eat every day, and all of those foods are derived ultimately from plants—of which corn is one of the most important, because it feeds us both directly and indirectly through the meat we consume.

Since farm creatures must eat grains before we can eat them, it becomes plain that the hours of sunshine and the inches of rain that fall on a cornfield—or any other field of produce — are really the fundamentals of life for all of us—granted that there are kernels of corn or other seeds planted and cared for in our soil.

* * *

BROADCAST

By F. W. Kavanagh

EXPANDING *the editorial on "Some Unconsidered Aspects of Penicillin" written by Dr. William J. Robbins for the August Journal, Dr. F. W. Kavanagh, research assistant in the laboratory of Dr. Robbins, spoke on "Penicillin—Twentieth Century Drug" in the broadcast given by the New York Botanical Garden over station* WNYC *Sept. 8. He showed how penicillin could not have been discovered, developed, or commercially produced a century earlier.*

THE DISCOVERY of penicillin, it was pointed out in the introduction to the program, is one of the most important discoveries of the twentieth century, for it will probably be responsible for the saving of more lives than any other therapeutic agent ever known. The wounded

soldiers of the allied armies have a far better chance of recovery than those of the enemy, because in our base hospitals back of the battle lines, large quantities of penicillin are now available for their treatment. The sulfa drugs are also being used against the poisoning that arises from infected wounds, but penicillin is many times more powerful and, against certain infecting organisms, it is far more effective. Yet, this is the first war in which such a curative agent has been or even could have been possible.

After reviewing the history of the great discovery (much as it appeared in this Journal for November 1943), Dr. Kavanagh explained some of the factors essential to the discovery which were unknown a century earlier. These were the petri dish, in which Prof. Alexander Fleming was growing a culture of *Staphylococcus* when he first observed the action on the bacterium of *Penicillium notatum;* the agar that was used as a medium in the petri dish; and not only the bacteria themselves, the behavior of which made the discovery possible, but also the species of *Penicillium* (*P. notatum*) which was infecting the bacterial culture.

Notatum the Best Species

"The remarkable thing about this discovery is," Dr. Kavanagh emphasized, "that of all the species of *Penicillium* known and since then tried, *P. notatum* is the best for the purpose of the entire group."

He spoke further of the requisites for the development of penicillin, pointing out that without cotton plugs for the flasks or test-tubes in which an organism might be growing, a culture could not be kept pure; thus it would be impossible to isolate penicillium. "In fact," he said, "the very concept of a pure culture was unknown until Robert Koch introduced it about 1880." Cotton plugs were first used in 1854.

Commercial production of penicillin would have been impossible even forty years ago, he said. A very special medium is used, one which was worked out by the Northern Regional Research Laboratories in Peoria, Ill., run by the U. S. Department of Agriculture. One of the most important of the nutritional substances provided in this medium for the growth of the mold was unknown during the early years of this century. Moreover, the acidity of the medium must be kept under careful control, and up to 40 years ago there were no means for measuring acidity. The technique has been developed only within the last 30 years. (Information on the nature of the medium and on the exact methods of production is restricted until after the war.)

Rare Chance for Discovery

Both Professor Fleming and Prof. Howard Florey (who have since been knighted for their work) had a part in the development and application of penicillin, Dr. Kavanagh made clear. "The important thing is" he said, "that Fleming, when he saw what was happening to his bacteria, realized that he was observing a phenomenon that might have some application outside of the laboratory. While Fleming's discovery was accidental, he deserves special credit because work in this particular field had been done before by many people who must have seen this sort of phenomenon and failed to realize its significance. When Fleming saw his staphylococcus killed by some kind of penicillium, he proved that a material substance was responsible, and this substance he named penicillin.

"The fact that two such significant organisms happened to be growing together is especially remarkable because penicillin is active against comparatively few of the organisms anyone would be likely to be growing in a laboratory. The chances of *Penicillium notatum*, of all fungi in the world, contaminating a petri dish containing a susceptible organism are very, very few. To reduce the chances of discovery still further, all of this had to happen before the eyes of a man who could interpret the meaning of it all, and that man was Fleming.

A Trained Mind at Work

"To me, this is a good illustration of the difference between a trained mind and an untrained mind. The trained mind realizes the significance of the accidental discovery. The untrained mind observes and lets the matter pass. Most of the so-called discoveries of the world are the results of accidents happening to trained persons who realize the importance attached to them. Considering everything, the wonder is not that penicillin was discovered as late as 1929, but that it was discovered at all."

TROPICAL EXPLORATION

A Prospectus and a Report

Leaving for Mexican Expedition

E. J. ALEXANDER is leaving New York this month with Thomas MacDougall, who is a Collaborator of the Botanical Garden, to spend six months exploring little known parts of southern Mexico for botanical and horticultural material. The expedition is being sponsored by the New York Botanical Garden.

For the past fifteen years Mr. MacDougall, who is a landscape designer and nurseryman in New York, has spent an average of four months each winter in Mexican exploration, and has presented the Garden with the living material which he has brought back.* His collections have already netted more than a score of new species of which eight succulents have so far been published by Mr. Alexander, and one new genus in the Cactus family, to be published in the *Cactus and Succulent Journal* in December. He is familiar with most of the regions where they will travel, and knows of many plants that have not yet been collected from some of these places. Certain mountains in their itinerary have never before been explored by botanists, and on others he is believed to be the sole collector. A considerable amount of new material therefore is expected from the trip.

Mr. Alexander and Mr. MacDougall will do their exploring from three main centers: Mexico City, Oaxaca, and Tehuantepec. Around Mexico City, they will explore the slopes of the two famous volcanoes, Ixtaccihuatl and Popocatepetl, and the nearby Malintzin (or Malinchin); also the edge of the tropical belt which comes up from the southeast, the desert area which runs down into Oaxaca, and, south of the city, the lava flow desert which is known to be the exclusive home of a number of unusual plants. Specimens for the Botanical Garden's herbarium, as well as seeds, bulbs, tubers, and rhizomes for culture, will be collected from all the areas explored.

Around Oaxaca, in an area covering three-fourths of the state, they will visit chiefly mountain and desert country, some parts of which are known as classical collecting grounds from which botanists in the past have found much new material, and other parts of which are relatively unexplored. One area they will be able to approach over a road completed only last year, making it available for the first time from Oaxaca.

Going southeast to Tehuantepec, where they will travel partly on foot, collecting as they go, they will find many mountainous regions untrammeled by previous explorers. They plan to follow the line of the Trans-Isthmus Railroad to Santa Lucrecia and of the Pan-American Railroad in Chiapas to the Guatemalan border, going into the mountains from various towns along the way.

Then returning to Tehuantepec, they expect to travel eastward by another route and to do additional exploring in Chiapas, particularly on the high cold plateau and in the mountain and lake district near the border, from around which they hope to gather material of botanical importance.

The expedition will return to New York, it is expected, late in the spring.

* Some of his plants were described in this Journal for December 1939.

Returned from Surinam

DR. BASSETT MAGUIRE arrived back in New York the last day of October after an absence of eight months on a tropical expedition in South America. The trip was sponsored by the New York Botanical Garden, with the financial aid of the John Simon Guggenheim Memorial Foundation and the American Philosophical Society, also Pierre Jay of the Board of Managers, and was carried out with the co-operation, in the field, of the Governments of British and Dutch Guiana.

Six weeks of the period was spent exploring the savannahs above Kaieteur Falls in British Guiana and ten weeks were passed on the top of Table Mountain in Surinam (Dutch Guiana), a mesa covering more than a hundred square miles which had never before been explored.

The trail by which Dr. Maguire ascended the thousand-foot escarpment of the great Surinam table-land was located from an airplane in which he reconnoitered over the mountain just before he started upriver from Paramaribo on the expedition itself. To reach it required five weeks of jungle travel by river and foot, then three weeks more of strenuous climbing up the precipitous trail to the top. After his return to Paramaribo in October he made another airplane trip above the region where he had traveled and explored.

From Kaieteur, Dr. Maguire brought back 4,000 herbarium specimens of about 600 different species, the largest number ever collected on one trip to that region. From Table Mountain and the jungle by which he approached it he collected 11,000 specimens, making a total from the two Guianas of approximately 2,500 species and about 15,000 individual specimens, mainly of flowering plants and ferns.

An important additional part of his collections consists of about 500 samples of tropical woods, mostly different kinds, from which he believes that extensive exploitation of the jungle trees for fine timbers for cabinet-work can be made. Many of these woods, he says, are beautifully colored—red, orange, purple, yellow, brown—and many of them have a fine grain. Herbarium specimens likewise were collected from these trees, and seeds were gathered from a few.

Living material also was brought back from Surinam and British Guiana, and some of this already is established in the Garden's propagating house. Of nearly 200 specimens of bulbs, tubers, rootstocks, and rhizomes, about half are orchids.

Dr. Maguire took about a thousand photographs in the regions where he explored, his pictures of Table Mountain being the first ever made of this newly discovered mesa.

A more complete report of his trip will appear in this Journal later.

Radio Programs Presented by the Garden

Alternate Fridays, 3:30 *p.m.,* WNYC (830 *on the dial*)

Nov. 3 ***Building a Better Garden in the Fall***
Ralph Bailey, Garden Editor, House Beautiful Magazine

Nov. 17 ***Plastics from Plant Materials***
W. D. Turner, Consultant, Plastics Industries Technical Institute

Dec. 1 ***Textiles—Natural and Synthetic***
Bernice P. Bronner, American Standards Association

Dec. 15 ***Vines Inside the Living-room Window***
Helen Van Pelt Wilson, Co-author, "Enjoy Your House Plants"

Dec. 29 ***The Botanical Garden's Own Quiz Program***
Carol H. Woodward, Editor of the Journal

Notes, News, and Comment

Members' Day. A box of samples showing products of Brazil, received by courtesy of the Amazonas Commercial Association of Manaos, formed the nucleus of the exhibit and program for the first Members' Day of the autumn season, Oct. 4. Useful and ornamental plants of Brazil, brought over from the Garden's conservatories, were banked across the front of the Members' Room, while the plant products, accompanied by descriptive labels, occupied the two sides of the room. Beverages, nuts, fibers, oils, waxes, rubber products, vegetable ivory, coumarin, manioc, and cubé were among the articles of commerce on exhibit. Guaraná was served in the form of an iced drink, and at the tea table coffee and maté were served. Dr. William J. Robbins gave a brief talk on Brazil and its products. The materials shown were afterward placed on view in two large cases which have been set on either side of the doorway of the Museum Building. About a score of the products were briefly described on sheets which were distributed to all present. A few extra copies of these are still available, and will be mailed to any address upon receipt of 3 cents postage.

Visitors. Among the visitors to the Garden on Members' Day were Dr. Luys de Mendonça-Silva, a physician in Rio de Janeiro, who is in this country studying public health problems, and José Garrido Torres representing the Brazilian Government Trade Bureau in New York. Dr. de Mendonça, who is also an orchid fancier, had previously visited the Garden in company with Dr. Onofreo Avendaño of Chile.

J. M. Waterston, Plant Pathologist in the Department of Agriculture in Bermuda, stopped at the Garden Oct. 27 on his way to Cornell University, where he will spend a year working on the fungi of Bermuda, a project in which the Bermuda Government, the Garden, and Cornell have been collaborating.

Genevieve Dawson of the La Plata Museum in Argentina visited the Garden at the end of the month. She is beginning her second year of work on wood anatomy under Dr. I. W. Bailey at Harvard, on a fellowship provided there. During the previous college year she worked in the same field on a fellowship from Radcliffe College.

Appointment. Dr. William J. Robbins has been elected a member of the editorial board of the *American Journal of Botany*.

Guest Speaker. Dr. E. L. Palmer, Professor of Rural Education at Cornell University, addressed a group of 52 teachers from the Bronx, Manhattan, and Brooklyn, at the Oct. 18 session of the Nature Study course being given by the New York Botanical Garden in co-operation with the New York City Board of Education. Known for his preparation of the Cornell Rural School Leaflets, Dr. Palmer based his talk, which was on "Little Climates," on the Leaflet of January 1944. He described the way that microclimates affect the lives of some of the small animals, insects, and plants, and explained what equipment would be suitable in the Nature Room to enable youngsters to study the influence of light, temperature, wind, and moisture on plant and animal material. He also told how simple devices can be built to measure moisture changes, wind velocity, and how to keep records of the weather.

Lectures. Roberta Ma spoke on "Food Plants of China" before the Federal Plant Quarantine Club of New York Sept. 13. Dr. F. J. Seaver addressed the Morristown Garden Club, an Affiliate of the Botanical Garden, Oct. 18 on "Fungi in their Relation to Man."

Movie. G. L. Wittrock showed the Garden's motion picture in color at an executive session of the Hippocrates Society Oct. 16 at the Concourse Plaza Hotel. Dr. E. E. Naylor presented the film at a meeting of the Bronx Academy of Arts and Sciences Oct. 23 and again Oct. 26 at the annual meeting of the National Plant, Flower, and Fruit Guild at the Pennsylvania Hotel, where he also talked on the activities of the Garden.

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The New York Botanical Garden was incorporated by a special act of the Legislature of the State of New York in 1891. The Act of Incorporation provides, among other things, for a self-perpetuating body of incorporators, who meet annually to elect members of the Board of Managers. They also elect new members of their own body, the present roster of which is given below.

The Advisory Council consists of 12 or more women who are elected by the Board. By custom, they are also elected to the Corporation. Officers are: Mrs. Robert H. Fife, Chairman; Mrs. Elon Huntington Hooker, First Vice-Chairman; Mrs. William A. Lockwood, Second Vice-Chairman; Mrs. Nelson B. Williams, Recording Secretary; Mrs. Townsend Scudder, Corresponding Secretary; and Mrs. F. Leonard Kellogg, Treasurer.

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CAROL H. WOODWARD, Editor

ANTI-MALARIALS

Fourth in a series of editorials designed to show the unique and specialized services that are furnished to the public without cost by the New York Botanical Garden

LOSS of the major sources of quinine has been for us one of the most serious difficulties resulting from the occupation of the Far East by the Japanese, for quinine has long been known to be a specific for malaria, and much of the fighting is being carried on in areas where malaria is prevalent.

Because of this need, not only are efforts being made to exploit the natural stands of *Cinchona* in South America, but every possible substitute for the control of malaria has been investigated by someone somewhere.

Almost every plant which is bitter has been considered at one time or another to be a febrifuge and a preventive or cure for malaria. As a consequence, one suggestion after another has been relayed to the New York Botanical Garden with a request for information about a particular plant's value as an anti-malarial agent. Most of the plants suggested have no anti-malarial properties, but each request has been treated most seriously and our best efforts have been used to supply any help we could. The usefulness of quinine was discovered because someone paid attention to the reports of South American Indians that it was a cure for malaria.

In some instances our living collections have supplied a plant difficult to obtain elsewhere, our library has furnished information available in the literature, and our herbarium and our staff have been consulted for identifications. For example, a fungus, *Polyporus officinalis*, has been stated to contain quinine. and we had the pleasure of furnishing one of the larger drug companies with a culture of this fungus and advising where further material for investigation might be obtained.

(To be continued)

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The Jungle Tree of Dangling Seeds

By Gerold Stahel

Beans from the Pods of a Little Known Surinam Species of Swartzia Hang on Threads up to Ten Feet Long

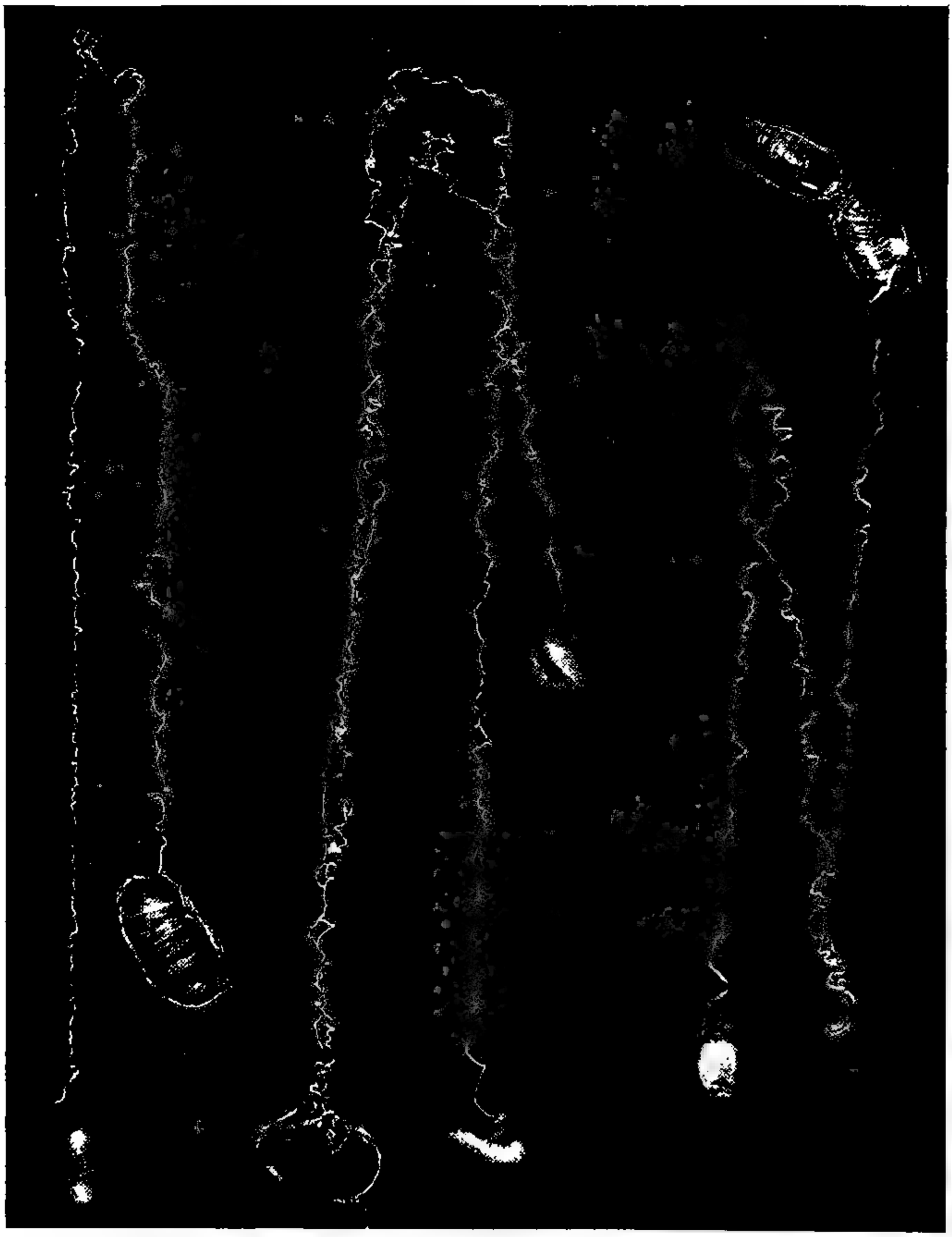
ONE April day many years ago, when I was collecting plants in the hilly country near the railway station in Section O, at 67 kilometers up from Paramaribo, as I was looking through my binoculars for flowers and fruits in the green canopy of branches above, I noticed one of the strangest and most striking things I had ever observed in our jungles. Below the branches of one of the trees 70 to 90 feet above the ground, I first saw dozens, later hundreds, of seeds dangling in the air on long fine threads. When the tree was cut, we found brownish beans hanging on slender filaments, most of them 5 to 7 feet long. The longest measured as much as 10 feet.

There are either 1 or 2 seeds in each pod, which opens with two valves. On one side the bean is covered with a comb-like yellowish arillus or aril to the top of which the funiculus is attached. In the closed pod the funiculus lies in one flat layer in a hundred or more bends on the surface of the bean. When the valves open, the seed falls down, hanging by the funiculus, which unfolds swiftly and without complications in its whole length. The upper end of the funiculus is fixed on one side of the valve, and the seed may dangle in this way for a day or more.

A tree with ripe fruit in April may be expected to have flowers in December, when, after the big dry season, the small rainy season begins. So we went back at that time and found the trees flowering. But even with our binoculars it was by no means easy to detect the small, inconspicuous cauliflorous racemes of minute brownish flowers. They have a 3-parted calyx and no petals at all.

Dr. Stahel is Director of the Agricultural Experiment Station of Surinam in Paramaribo, and was the author of the article on the fungus gardens of the leaf-cutting ants, which appeared in this Journal in November 1943.

When flowers and a box with ripe fruits in alcohol were sent to Holland, they were determined as a new species, *Swartzia minutiflora* Kleinh. Later, the wood sample we sent was found to be practically identical with wood collected by Sagot in 1858. In 1775 this tree was already described by Aublet under the name *Bocoa prouacensis*, though



Seeds of Swartzia prouacensis pulled out from their pods, with the funiculus still attached to the aril and to the side of the pod.

These opened seed-pods of Swartzia prouacensis, shown here natural size, reveal the many ways in which the one or two seeds may be arranged in the brown streaked pod. When there are two, the long funiculi, each attached by one end to the pod and by the other to a thick greenish aril on each side, are coiled around and between them. These funiculi have great elasticity, and in some seasons have been found stretching seven feet and more down from the pod, with the ripe seeds swaying from the end.

he never found flowers or fruits. Later Sagot collected herbarium specimens with fruits only. When the different specimens were compared, they proved to belong to the same species. Our Swartzia therefore had to be renamed *Swartzia prouacensis* (Aubl.) Amsh. (1939).

The genus *Swartzia* (Leguminosae) is well represented in our Surinam jungles. Up to date ten different species are known, but there are still more. Some have deeply fluted trunks divided almost to the middle of the trunk into irregularly shaped planks (*S. remigifer* Amsh.). Others, such as the BANJA, show many deep cavities in the trunk. The *Swartzia* we are speaking about here belongs to a type with simple cylindrical trunks and a crown of ascending, moderately spreading branches.

The wood is dark brown or nearly black. The whitish sapwood is sharply demonstrated against the dark heartwood. It is an extremely hard and heavy wood. Near Section O this tree is one of the most common ones. In 1912 a shipment of about 20 logs of this timber was sent to Hamburg to try it as a substitute for lignum vitae. But prices were not remunerative and no further shipments followed. The Surinam Indians use this wood for the big pestles of their wooden mortars. Occasionally walking-sticks are made of it.

When we collected these seeds again in March 1944, the pods were not fully ripe, the seeds were whitish, and we did not see a single seed dangling below the branches. The funiculus enclosed was only 2 feet long, probably because the pod was not fully ripe or weather conditions were unfavorable for the development of a long funiculus.

The Arawak Indian name of this tree is ITIKIBOROBALLI HOHORODIKORO. The word HOHORODIKORO means: growing on elevated, hilly places. ITIKIBOROBALLI is the name of the common ironwood, *Swartzia tomentosa* DC., in Surinam called "gandu," in Brazil "candeia." ITIKIBORO is the bebé-tree, *Pterocarpus officinalis* Jacq., a very common tree of the coastal swamps with big buttresses. The suffix BALLI means "looking like." In our language, therefore, the name of this *Swartzia* is: the highground form of the tree that resembles the bebé-tree. There is also a highground bebé, *Pterocarpus rohrii* Vahl, which is called ITIKIBORO HORODIKORO.

Notes on the Arawak Indian Names Of Plants in Surinam

By Gerold Stahel

ARAWAK Indians in Surinam, when they are naming plants and animals, make liberal use of the suffix BALLI to reduce the number of primary or "generic" names of the hundreds, maybe thousands, of kinds they have to distinguish. For this purpose they have still two other words—DJAMARO and OJOTO. The first means the same as BALLI, the second "related to."

For example, *Eschweilera simiorum* Eyma (Lecythidaceae) is a tree of the high jungle. Its Arawak name is WADILI LANNABALLI DJAMARO, and it is composed as follows:

Native name	Botanical name and authority	Family
LANNA	= *Genipa americana* L.	Rubiaceae
LANNABALLI	= *Gustavia augusta* L.	Lecythidaceae
LANNABALLI DJAMARO	= *Gustavia hexapetala* Smith	"
WADILI LANNABALLI DJAMARO	= *Eschweilera simiorum* Eyma	"

WADILI = male, and means big; HIARU = female, and means small. A tree closely resembling *Eschweilera simiorum* would be named WADILI LANNABALLI DJAMARO OJOTO, which means: the big variety of a tree, related to another one, that looks like a third, which resembles *Genipa americana.*

The adjectives DJAMARO and OJOTO—the first is the more common one—are also used independently from the suffix BALLI. The following example may be given:

TÁTABU	= *Diplotropis guianensis* Benth.	Leguminosae
TÁTABUBALLI	= *Coutarea hexandra* K. Schum.	Rubiaceae
TÁTABU DJAMARO	= *Copaifera epunctata* Amsh.	Leguminosae
TÁTABU OJOTO	= *Ormosiopsis flava* Ducke	"

All four are high jungle trees. The first, "zwarte kabbes," is a well known Surinam timber, the others are less important, but all resemble TÁTABU.

In these examples the general habit of the tree looks like that of another one. In many cases, however, the names are given when only a part of a plant resembles that of another.

Vochysia mclinonii Beckm. has a long, straight, round trunk just as that of the ité-palm, *Mauritia flexuosa* L., which provides a reason for calling this tree ITÉBALLI.

The name of the common cannonball tree, *Couroupita guianensis* Aubl. (Lecythidaceae), is IWIDABALLI because the fruits have about the same size and form as the fruits of the calabash tree, *Crescentia cujete* L., called by the Arawaks IWIDA.

Bombax globosum Aubl., known as KUNANABALLI, is a kind of kapok-tree with pear-shaped brown fruits. The much smaller fruits of the common Paramakka-palm, *Astrocaryum paramaca* Mart., which is called KUNANA, have the same form and color.

Another *Bombax, B. nervosum* Uitt., is a very big tree, endemic in Surinam. Its name is KUNANABALLI KU'MAKA DJAMARO. KU'MAKA is the kapok-tree, *Ceiba pentandra* Gaertn., probably the biggest tree in our jungles. The name KUNANABALLI KUMAKA DJAMARO therefore means the kind of *Bombax* that is as big as the *Ceiba*. KUMAKABALLI would be the more usual combination, but the Indians avoid a second BALLI in one plant name. Years ago another Arawak Indian called this tree KUNANABALLI WADILIKORO, that is, the male or big *Bombax*.

The red, curved flowers of the common herb *Centropogon surinamensis* Presl (Campanulaceae) look much like the small red fruits of Chili or Cayenne pepper, *Capsicum frutescens* L., which is called EMENALI. For this reason *Centropogon* is called EMENALIBALLI.

There are many kinds of wild *Vanilla* in Surinam, growing on palms and trees. They are called KUMAYE (or KUMAJE), because the broad leaves look much like the tongue (EYE or EJE) of the tapir (KUMA).

The epiphytic orchid, *Brassavola angustata* Lindl., has hanging leaves that are rounded like the stalk of the plant. The leaf resembles the tongue of the small ant-eater, *Tamandua tetradactyla* L., known as WALITI. The Arawak name of *Brassavola* is thus WALITI-EYE (or -EJE), the ant-eater tongue.

Our indigenous rubber tree, *Hevea guianensis* Aubl., has a slightly yellowish latex resembling that of *Thevetia neriifolia* Juss. This small tree, called SEWEJU, is planted in most Indian villages for its seedpods, which

are used as rattles for dancing. The name for our *Hevea* is SEWEJUBALLI. There is also an old name for SEWEJUBALLI: SAPARAPA; in the Carib language "mapalapa." The Arawak SAPARAPA is obsolete and no longer in use today.

The leaves of the vine *Arrabidaea chica* Bur. (Bignoniaceae) are used in the Guianas and all over the Amazon valley for the manufacture of a red dye for staining the home-made cotton fabrics. There is also a red loam rich in iron, which the Indians commonly use for painting their home-made pottery. This loam has the name KULI, therefore *Arrabidaea chica* and its dye are called KULIBALLI.

One of the best Surinam woods for local use is "pisi," a collective name for some 20 or 30 members of the Lauraceae of the genera *Nectandra, Ocotea, Acrodiclidium* and *Mezilaurus*. The Arawak collective name is SIRUWABALLI. The meaning of the word SIRUWA is no longer known to our Surinam Indians. In northeast Brazil, however, black mangrove, *Avicennia nitida* Jacq. is called "siriuba," which is the same name as SIRUWA. The general habit of the SIRUWABALLI is indeed much like that of black mangrove. In Surinam today the Arawak name of *Avicennia* is KORODA. Even the oldest Arawaks cannot remember having heard the name SIRUWA for KORODA.

In the volumes of Pulle's "Flora of Surinam" and in Record and Hess "The Timbers of the New World" a few hundred Arawak names of Surinam plants are mentioned. A few of the most commonly used adjectives may be given here.

KHALEMERU*	shining	KIBELE KIBERUBANA	broad leaf
KHAREMERU	black	FIRIBERUBANA	big leaf
HARIRARU	white	IBIBERUBANA	little leaf
KULERU	red	IBIKOROBOROBANA	narrow leaf
TATARU	hard		
BELERU	soft		
KUJETSI	slimy		

BARALEBOKORO	growing along the coast
UNEBEREBANDIKORO	" in swamps
UNILEBOKORO	" along rivers and creeks
HOHORODIKORO	" on high land
KALA-UMBANDIKORO	" on savannah
KONOKODIKORO	" in high jungle
ADASIDIKORO	" epiphytic in trees

Many plant names are connected with the word JAWAHE, meaning devil or ghost.

There are several wild species of *Passiflora* (MEREKUJA) with edible fruits. In the high jungle grows *Passiflora glandulosa* Cav., with red flowers, but with fruits, however, that are not edible. This may be the reason why it has the name of JAWAHE MEREKUJA, the devil's passion-flower.

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*In the Flora and in Record and Hess 'u' is written in the Netherlands fashion as 'oe.'

Jungle scene in Surinam, photographed by the author near Section O on the railroad, where trees of Swartzia prouacensis were found. Two of these curiously fruited trees are in the background, four Arawak Indians standing between them. The palms in the picture are Astrocaryum paramaca.

Basanacantha spinosa K. Schum. (Rubiaceae) is a shrub with two to four spines in the axils of the leafstalks. The thorns remind the Indians of their fish arrows with the three separate points, called SARAPAN. For this reason they call this thorny shrub JAWAHE SARAPAN, the devil's fish-arrows.

The strange fungus, *Polyporus sapurema* Möller, growing from big subterranean sclerotia and weighing ten pounds and more, is known to our Arawaks as JAWAHE DUADAN—that is, devil's pot.

In the shade of the big jungle, several chlorophyll-free plants are growing on the ground. Two of the strangest of them are *Helosis guyannensis* Rich., of the Balanophoraceae, occurring on the sand and shellriffs in the coastal belt, and *Staheliomyces cinctus* Fischer, a widespread phalloid type of fungus found in the hilly interior. For both plants our Arawaks use the same name, JAWAHE WERA, which means devil's phallus.

When an Indian in the jungle is asked to give the name of a tree, he first cuts a piece of the bark to taste and to smell it. Many plants therefore are named according to their odor.

JULIBALLI is a well known Surinam tree known as "sali." The wood is much used for carpentry. Its generic name is *Tetragastris* (Burseraceae). The bark smells like tobacco, which is called JULI. Still another plant is called JULIBALLI: *Lisianthus alatus* Aubl. (Gentianaceae), a robust savannah herb with blue flowers, which reminds the Arawak of the tobacco plant. Thus we have here the same name for two plants, one that smells like tobacco and another that looks like it.

The name of garden balsam, *Justicia pectoralis* L. (Acanthaceae), a sweet-scented, procumbent garden herb, is KUMARUBALLI, because it smells like KUMARU, which is *Coumarouna odorata* Aubl., the common tonka bean.

Acrodiclidium martinianum Mez. (Lauraceae) is a big jungle tree. Its name is SIRUWABALLI KAROWATSJAMARO. KAROWATSJAMARO means "resembling burned wood"—that is, smelling like it.

In the Euphorbiaceae, *Conceveiba guianensis* Aubl. is called MABABALLI HARIRARU, the white mababalli or mabi-tree. On this tree the bees (MABA) like to make their nests. MABABALLI doesn't mean "looking like bees," but refers to the fact that the tree attracts bees.

Because of its penetrating odor, *Siparuna guianensis* Aubl. (Monimiaceae) is used in popular medicine. MUNIRIDAN BOJARE is the name given to this small tree. MUNIRI is the big, black, badly stinging ant, *Ponera clavata*. DAN means tree and BOJARE means strong-smelling. Therefore it is the tree that has the strong odor of this particular stinging ant.

Many other plant names come from their popular use in medicine.

Guarea gomma Pulle (Meliaceae) is a common tree in the northern part of Surinam. Its Arawak name is KARABABALLI WEDAKORO ABO.

KARABA is crabwood, *Carapa procera* DC. WEDAKORO means emetic and WEDAKORO ABO containing an emetic. It is found in the bark of the roots.

People in Surinam occasionally suffer from cracks in the skin of the feet, sometimes the result of a framboesia infection. The Arawak name for these cracks is EBESERE. A common herb in the highground jungle, *Xiphidium coeruleum* Aubl. (Haemodoraceae), is used against this ailment. Its name is EBESERE BINA, meaning medicine against EBESERE.

The white bare quartz sand of the savannah, for instance near the airfield of Zanderij, is locally covered during the rainy season with the blood-red, minute rosettes of *Drosera pusilla* H.B.K. The Indians collect several dozens of these plants, place them near a fire to wither, wrap them in a piece of cotton cloth, press the sap out of them and drop it into blear eyes, called JEBERU, to cure them. The name for *Drosera,* JEBERU BINA, means medicine against blear eyes.

A common herb on poor sandy soil is WALUKUMA KUBIA, *Paepalanthus bifidus* Kunth (Eriocaulaceae). The small white flower-heads stand on long thin stalks in a big umbellate inflorescence. This reminds the Arawak of the glistening morning star, WALUKUMA. KUBIA means something that opens the eyes. Sometimes when Arawak wives have to rise for their work very early in the morning, long before dawn, they collect several of these white, star-like inflorescences on the previous day and put them in a pot with water. After rising, they wash their eyes with this water; it helps them to awaken quicker and to do more efficient work in the hours before dawn. The morning star awakens them!

The parasitic vine *Cassytha filiformis* L. (Lauraceae) grows commonly on the low shrubs of the savannahs. It looks exactly like dodder (*Cuscuta*). The Arawak name for it is KARUBA KÖLÖ. KARUBA is a savannah fowl, *Ortalis motmot,* that runs very quickly among the shrubs and becomes often entangled with these parasitic vines. The strings may wrap themselves around its legs. The Indians wear broad cotton bands, called KÖLÖ, below the knees and above the ankles for dress show. KARUBA KÖLÖ therefore means the KÖLÖ, or bands, that are worn by these savannah fowl.

Several species of *Couratari* (Lecythidaceae), the big ingipipa or ulemari trees, grow in the Surinam jungles. The laminated inner bark of the true ulemari is commonly used by the Indians all over the Guianas and the Amazon valley for cigarette-paper. Other species furnish straps for carrying-baskets, guns, etc. From the bark of one of the ulemari trees the Surinam squirrel, *Sciurus aestuans,* called KALIU, strips the bast fibers to build its nest with. This tree can easily be distinguished by the many long scars the squirrels make in the bark. For this reason the tree is called KALIU ULEMALITI—that is, the squirrel ulemari species.

SEREBEDAN means the serebe-tree. The small silver fishes, called SEREBE (*Gasteropelecus sternicla* L.), swim and glisten by hundreds in the creeks and ponds of the lowlands. When the small shining leaves of this tree

The trunk of Swartzia prouacensis, photographed last spring for this Journal by Dr. Gerold Stahel.

are trembling in a light breeze, they remind our Indians of the serebes in the creek. Therefore the name SEREBEDAN for *Swartzia arborescens* Pittier.

WAKARADAN, *Miconia surinamensis* Gleason (Melastomaceae) has long, thin trunks. For this reason it is called the wakara-tree, which means stork-tree.

The red mangrove, *Rhizophora mangle* L., is called KAKUTJIRU. KAKUTJI means legs and RU many. It is the tree with many legs.

The leaves of many plants are eaten by special animals. For instance, *Coutoubea ramosa* Aubl. (Gentianaceae) is eagerly eaten by the waterpig,

KIBIVALA (*Hydrochoerus capybara*). It is named KIBIVALA TOKON, the food of the KIBIVALA.

IMIRITOKON, *Simaruba cuspidata* Spruce (Simarubaceae), called the noja-tree, growing along small rivers, has dark red acid drupes like dates. A small catfish called IMIRI (*Trachycorystes galeatus* L.) feeds especially on the fallen drupes of this tree. Therefore the name IMIRITOKON.

There are still many other -TOKON plants with the name of the animal that is accustomed to feed on them.

Several species of *Licania* (Rosaceae) are called MARISIBALLI. MARISI means corn. The bark of these trees is hard and brittle like the dry grains of corn.

The generic name of *Mora* was taken from the native name. *Mora excelsa* Benth. is a very common tree along the lower part of the rivers in western Surinam. There is another species, *M. gonggrijpii* Sandw., that is much less common and grows on high ground, not on land temporarily flooded, as the common MORA does. It is called MORABUKEA—that is, the elder brother of MORA.

The spiny fruits of *Apeiba echinata* Gaertn. (Tiliaceae), a big jungle tree, resemble a comb, which is called BAREDA. *Pithecoctenium echinatum* K. Schum. (Bignoniaceae), a vine, has fruits with the same kind of spines. For this reason the first is called BAREDABALLI and the second BAREDABALLI MIBIKORO. MIBIKORO means vine.

The name for the Spanish moss, *Tillandsia usneoides* L. (Bromeliaceae) is ADATIMA, meaning treebeard, just as in the American language.

In the jungles a big Bromeliad, called KARUADA, grows on the ground. Other Bromeliaceae, for instance *Acchmea,* grow in the trees, and these are called FUDIKARUADA—that is, ape-bromelia.

KAJEKUTSJI-IHI means tail (IHI) of the caymán, the native alligator. It is the name for *Phyllocactus phyllanthus* Link, a very common epiphytic cactus with flat stems, that look like a cayman's tail.

In the high jungle of the hilly interior, several vines of the genus *Bauhinia* (Leguminosae) are common. They have broad flattened stems, and the lower part sometimes lies on the ground. Inside this belt concave and convex parts are alternating. This reminds our Arawaks of a staircase. Therefore they call this vine HIKULI MUDEKUNA, or tortoise stair. HIKULI is tortoise, MUDE is to climb, and MUDEKUNA something to climb with. The Creoles have adapted this name to their own language. They call it "sekrepatu trapu," sekrepatu meaning tortoise.

In the jungle different kinds of *Commelina* spread over the ground. The Arawak name for *Commelina* is ULELARU, which means "spread."

Norantea guianensis Aubl. (Marcgraviaceae) has flowers that are inconspicuous except for the intensely red honeybeakers hanging below them.

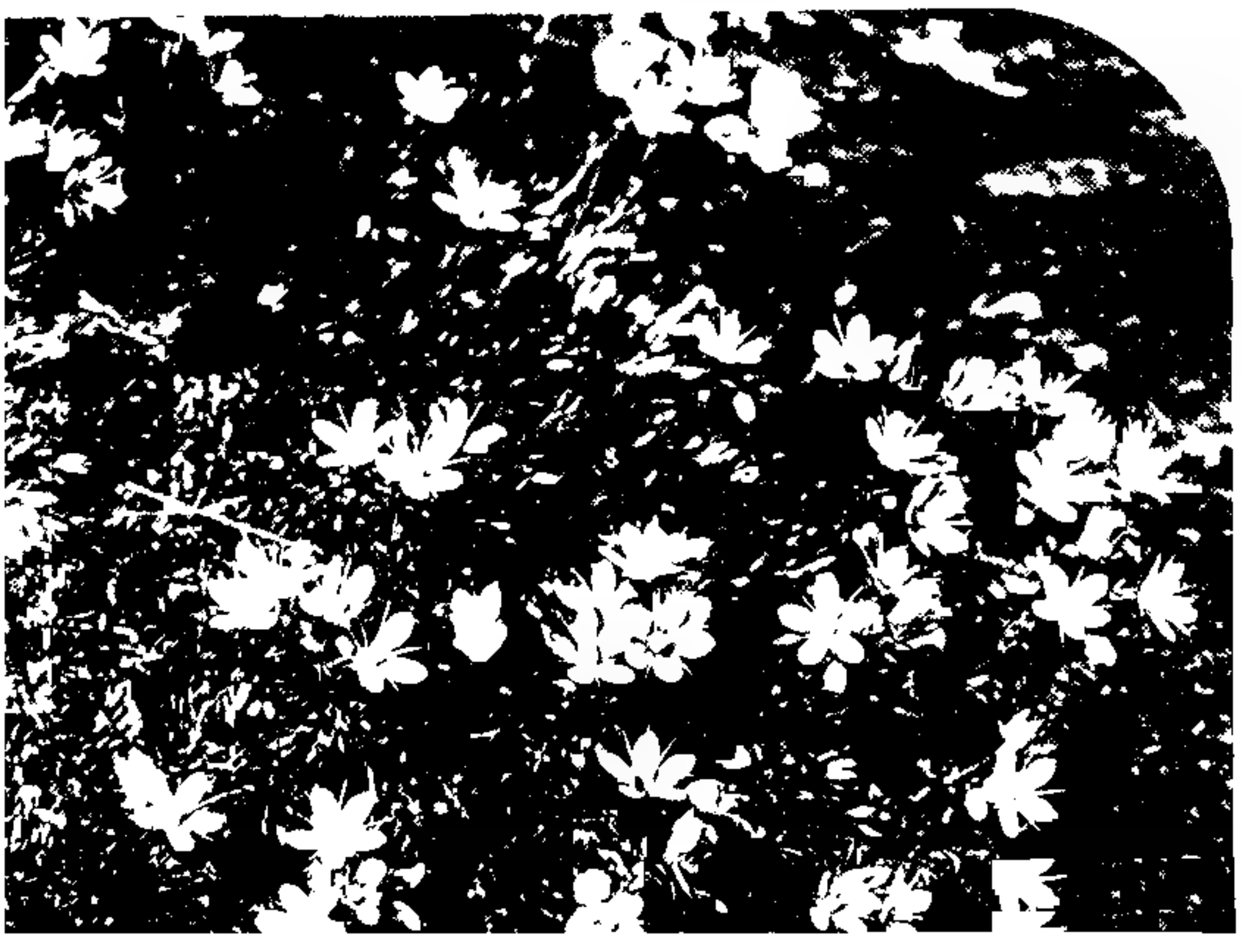
(*Continued on page* 278)

Wet mossy places are the home of the star-flower, Trientalis arctica (seen at the right), which closely resembles our native species.

Claytonia sibirica is the name of this spring beauty of the north, shown below.

Sieversia calthifolia (or Geum calthifolium), above, has brilliant yellow flowers and soft hairy leaves.

Many saxifrages cling to the rocks that comprise the Alaskan mountains. In the lower corner is Saxifraga Funstonii.



sitchensis (shown in the c
cause they like to grow with
the spray from a mou
stream.

Members of the Heath family are among the most attractive of the flowers of our northern territory. The miniature plant at the right, shown natural size, is Cassiope Stelleriana, Alaska heather.

Alaska heather.

Alaska heather.

WILDFLOWERS OF ALASKA

As photographed by

MAXCINE WILLIAMS

These pictures and others illustrated the Members' Day address November 1 by Mrs. Jerome W. Coombs. They are among the many flowers which even the casual visitor would find within walking distance of the heart of Juneau.

The leaf shape forms the distinguishing mark of th several foamflowers in Alaska. Above is Tiarella tr foliata, white-flowered like the rest of them.

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often
owers
zoffia

Shining leaves and rose-tinted waxy flowers on ta scapes characterize the shinleaf, Pyrola asarifoli below. Abundant and handsome, it is often use as a cut flower under the name of "wild lily-of-th valley."

THUNDERWATER

MOST of the Indian names mentioned in this paper were given to me by my old Arawak friend, Baptist. His Indian name is SASSAMALI, which means "nice fellow," and indeed no better name could have been given to him.

Baptist was born in 1878 in the village of Matta, a place that was still very remote in those times, on the edge of the Matta-savannah, some ten miles west of the airfield of Zanderij. In 1885 his father sent him to the Roman Catholic school in Paramaribo, where he became a clever disciple. After his school years had come to an end, Baptist would have preferred to remain in town, but his father called him back to the jungle.

Baptist, or Sassamali

forestry officer and myself traveled with him for weeks and months in our virgin jungles. Most of the hundreds of Arawak names in Pulle's "Flora of Surinam" come from him. I was always deeply impressed by his fine, intelligent, and polite manners. In contrast to other Indians who visited primary schools, he remained true to the old type of Indian and intimately close to the jungle life.

When Baptist comes to town, he is invited to our 10 o'clock cup of coffee, where the members of our Experiment Station and guests join for half an hour's recreation. Here he feels perfectly at ease. One morning a guest, a resident of British Columbia, told us about the Indians of his country far away in North America. Baptist listened attentively, then he said: "On the northern boundary of the United States is a big cataract, the Niagara. In our Arawak language UNIAKARA means thunderwater (UNIA means water). Maybe Niagara means the same. Should this be true, the Indians that lived once near the Niagara might have been related to our Arawak family of tribes."

—G. S.

In February, when *Norantea* is in full bloom, the trees, covered with this vine, present a gorgeous sight. Indeed, it is by far the most showy of all Surinam lianes. The Indians, however, not impressed by this splendor, prosaically call it KARAKARA, which means the water liane. As much as a drinking glass of fresh water can be collected from a piece one meter long cut off from this liane, when held straight above a glass. Other

lianes and thick superficial roots may yield water too, but KARAKARA is one of the most suitable for this purpose.

Two kinds of the cup-shaped bracket fungus *Auricularia* (Jew's ear) are eaten by the Indians, a reddish and a dark brown one. The first is called KUJALATE, meaning stomach of a deer, or ADADIKE meaning wood-ear; the second DULIDIKE, or negro-ear.

Groups of plants that are of no use to the Indians have collective names. For instance, most ferns are called ITULI IHI, the tail of the howling ape (ITULI), because the young developing leaves of the ferns are covered with brown-red scales and resemble, therefore, the reddish tail of *Myctes seniculus*. Orchids too are called collectively WAJULI.

Alaska's Flowery Promise

By Sarah V. Coombs

The Northern Territory Offers Untouched Possibilities In Plants to Grace Our Gardens in the States

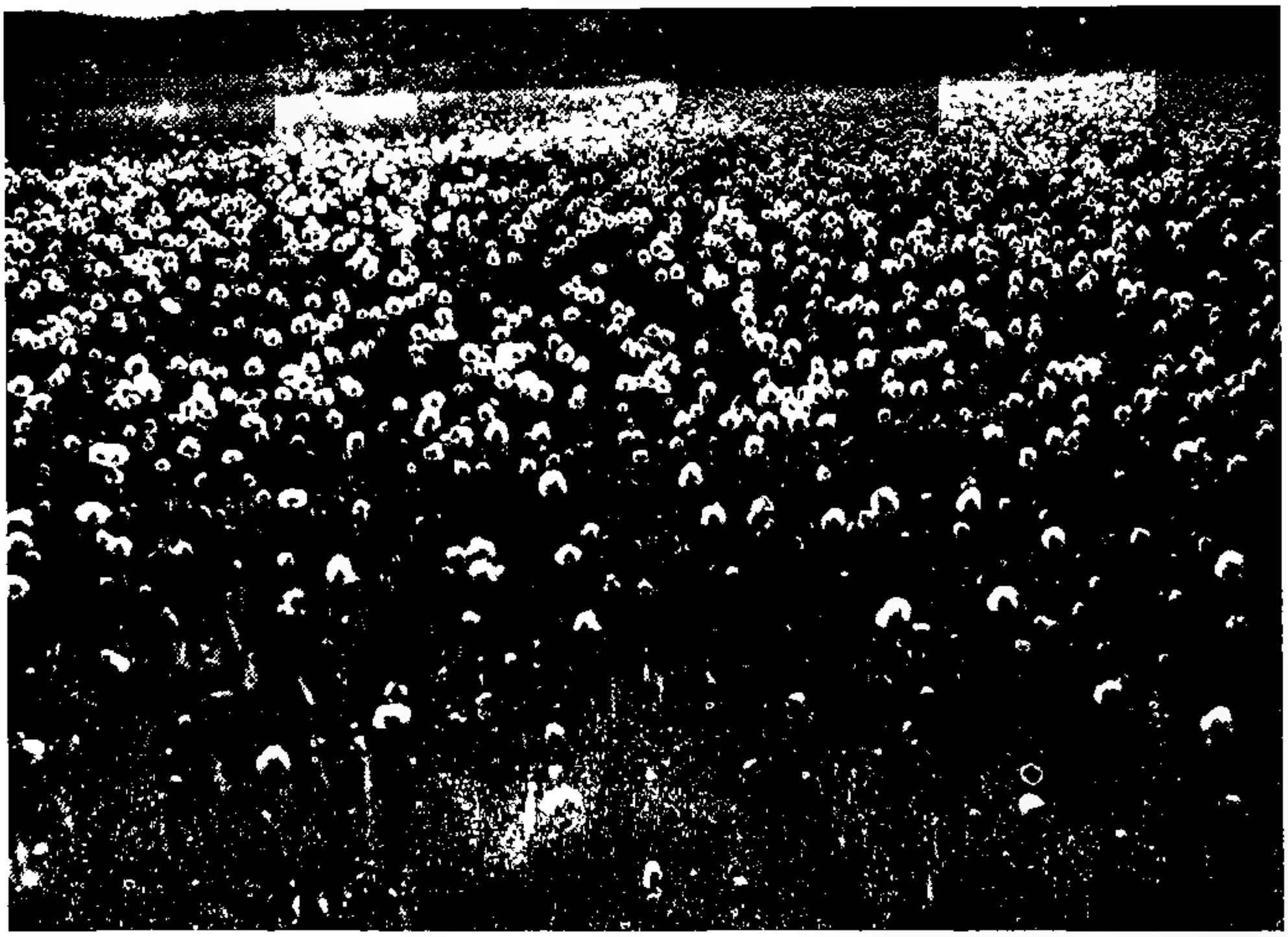
THE legend dies hard that Alaska is a land of perpetual snow and ice, of travel by dog-sleds, of inhabitants clad in fur parkas, facing temperatures of 70 degrees below zero. In certain sections, there *is* much snow, intense cold and a return to primitive condition in winter, but summer brings the long days of sunlight and a wealth of flowers. The

"Woodnymph" and "single delight" are names of Moneses uniflora, shown here natural size in its setting of moss, where it was photographed by Maxcine Williams

growing season may be short but during the months when the sun goes to bed for only a few hours in the twenty-four, the flowers fairly rush into bloom.

The gardens are filled with blossoms of immense size and of brilliant color. Our common garden favorites are glorified, their dimensions extraordinary and their hues so bright as to be almost dazzling. There are over-sized dahlias and gorgeous nasturtiums, huge roses, twelve-foot delphiniums, and many others.

Those, however, are all what one of our experts here in the East calls "ex-aw-tics." Our real interest is with the native plants, and this gives us a chance to turn the table, for among Alaska's wild flowers are many which would grace our gardens. The reason they have remained so long unexploited traces back to Alaska's distance and the slow travel by boat. Now that planes fly in all directions, the great Territory comes nearer, and there will be many more planes and boats after the war. Even now, "Outsiders," as Alaskans call us, would be surprised at the well developed plane routes in the interior of the country. In bad weather, of course, all planes may be grounded for several days, but given good weather, they fly forth like the bursting of a bomb. There is a dash of craft in all



Some people call the cotton grass, Eriophorum Chamissonis, "Alaska cotton," because the northern meadows where it grows become as white as fields of cotton when its heads are ripe. Maxcine Williams of Juneau made this photograph just outside the town.

The Alaskan harebell, a Campanula of the rotundifolia type, dangles its delicate bells from the rocky slopes of the mountains. Photographed by Maxcine Williams.

directions, to many little far-off places which relied, until now, on coast or river travel or dog teams. No longer shut-ins, the inhabitants of these distant villages find a trip to Fairbanks, Anchorage, or Juneau, quite within the realms of possibility.

The photographs of Alaskan flowers reproduced here will indicate a little of the promise which the rich growth of this northern land offers for the gardening future. Many Alaskan flowers grow also in Canada's northwest and in ours. Many are known only in Alaska. Some of the plants are found growing in the muskeg, the soft, age-old springy turf which covers so much of the country. Some grow in the swamps, others in the foothills of the vast mountain country, and some seek even higher land where they find their homes almost at the snow line. Little crouching beauties, these might be persuaded to bloom in our rock gardens, if we gave them some shade and a cool, deep soil. We look to eastern Asia, to Switzerland, to northern Europe for our plants. It might be a good idea to see what Alaska holds for us in possibilities.

(*For additional photographs of Alaska's wildflowers, see pages 276 and 277*).

Notices and Reviews of Recent Books

(All publications mentioned here may be consulted in the Library of The New York Botanical Garden or may be purchased on order through the Library.)

Aid to Successful Gardening

10,000 GARDEN QUESTIONS. F. F. Rockwell, Editor. 1,467 pages, illustrated, indexed. Doubleday, Doran, New York, 1944. $3.95.

"10,000 Garden Questions" is a real attempt to give quick and simple answers to a great number of garden questions, particularly those most commonly asked by the amateur gardener. It does this for the most part well, and if the gardener fails to get entire satisfaction in a few cases the editors have provided other helps such as a list of the better books and bulletins and the addresses of the various State Agricultural Experiment Stations. No book published, or none which may be published in the future, will ever answer adequately *all* questions on gardening.

The book is arranged in ten sections, according to subject, each with an introduction by a well informed gardening expert. Before attempting to find the answer to any particular question, the introduction dealing with the subject should be read.

In arrangement of content and number of questions answered, this book is different from others which have been published, and it should be a useful addition to the libraries of those who have recently learned that gardens, to be successful, must have intelligent and loving care.

C. F. WEDELL,
Head of the School of Horticulture, State Institute of Agriculture on Long Island.

Straight Thinking on Vitamins

PLANTS AND VITAMINS. W. H. Schopfer. 293 pages, 17 figures and 3 plates. Waltham, Mass., The Chronica Botanica Co., New York City, G. E. Stechert & Co. 1943. $3.75.

Vitamins are regarded by some as figments of the imagination; they are valued by many as cures for all mental and physical ills and exploited by a few as a source of easy money. The sceptical, the gullible and the mercenary will find much in Schopfer's book to turn their thoughts to more correct channels.

A book dealing with plants and vitamins is particularly pertinent because plants are the fundamental source of vitamins. Plants make them from simple and elementary compounds and animals use them. Schopfer, whose research for many years has been concerned with the relation of plants to vitamins, discusses the synthesis of vitamins by plants, the relation of vitamins to those plants unable to synthesize some of them, the function of vitamins and many other topics which cannot be detailed here. Where a chemical formula is needed he does not hesitate to use it, and each chapter is followed by a selected bibliography. While not a "popular" book, it is written in a style which enables the amateur to grasp the significance of much the author has to say.

WILLIAM J. ROBBINS.

More Basic Science Education

BASIC SCIENCE EDUCATION SERIES. Bertha Morris Parker and others. Paper-covered booklets of 36 pages each, illustrated in color. Row, Peterson & Co., Evanston, Ill., 1943 44. 32 cents each.

This excellent series continues to add new titles. Some of the most recent are: Dependent Plants, An Aquarium, Plant and Animal Partnership, Soil, Water, Life through the Ages, Plants Round the Year, and Balance in Nature. Remarks made about previous titles * apply equally well to these; in general, they must be a boon both to youngsters and their teachers. Some of the errors, however (and there must be errors in a series of this scope), seem unnecessary. For instance, chlorophyll is not a "dye," bud scales do not keep buds warm in winter, crocus "bulbs" should not be confused with hyacinth and tulip bulbs

* In this Journal in February 1943 and earlier.

and onions, and "sunshine" is not always necessary for the making of food in plants. Moreover, this reviewer registers a protest against the picturing of presumably absorbed boys and girls with the silly smiles so familiar to us in American advertising.

Nevertheless, the series is heartily endorsed for its splendid presentation of natural science topics, both in words and pictures.

H. W. RICKETT.

Broad View of Tree Disease Work

PATHOLOGY IN FOREST PRACTICE. Dow V. Baxter. 618 pages, illustrated, indexed. John Wiley and Sons, Inc., New York, 1943. $5.50.

There have been two previous attempts to bring together and correlate the results of investigations in forest pathology. The first, by Hubert,[1] was intended to serve all with interests in forest pathology in the widest sense, from technically to non-technically trained people. The general arrangement was based on that of the fungi involved. The second, by Boyce,[2] was designed as a text for classroom use, with application in the specialist's field. The general arrangement was based on the parts of the tree affected. The present text goes a step farther and is based on the successive stages of development of the forest.

These three books well illustrate the progress made in forest pathology in the last three decades. In the early, exploratory phase, emphasis was on the fungus causing a disease, with slight regard for its victim's part in the struggle. Then came an appreciation of the part played in the disease battle by the attacked plant. Lastly, pathology has come to be an intimate member of the sciences contributing to the handling of the forest as an association of trees.

All three viewpoints are necessary for the most effective use of the extensive and badly scattered literature pertaining to the subject. The point has been reached where it is doubtful if a single writer can adequately treat forest pathology in all its multiple phases.

With these facts in mind, the present author has made an excellent pioneer attempt. He opens with a brief account of disease, the fungi causing disease, losses caused, and methods of appraisal of damage. Then come sections on diseases of seedlings in the nursery, of striplings in plantations, and of adults in the mature forest. These are followed by chapters on diseases of shade and ornamental trees, decays, and discolorations of forest products. The best known silvicultural practices for combating or preventing disease are indicated.

One of the weak points in silviculture is the inadequate study of the medium (soil) in which all trees must grow. This author, however, in his treatment of living trees, correctly emphasizes site characters as important if not decisive factors in the occurrence of disease.

In treating such a multiplicity of phases of the occurrence of disease and methods of treatment, much care is needed in arranging and correlating the material—apparently more than an author busy with many other matters can find possible. But if the book is used as designed, to learn what is known about a certain disease, this defect is not evident.

The book is well printed, has excellent illustrations, and apparently was well proof-read. Extensive bibliographies at the ends of the chapters aid in making it a real desideratum for the grower of trees.

PERLEY SPAULDING,[3]
New Haven, Conn.

Notes, News, and Comment

Cover Picture. One of the regions to be explored this winter for the New York Botanical Garden by Thomas MacDougall and E. J. Alexander is shown in the photograph taken by Mr. MacDougall and reproduced on the Journal cover this month. The view is of the Pacific slope of the Sierra Madre north of Cerro Atravesado, looking approximately eastward toward the highest peaks of the range between the Isthmus

[1] Hubert, E. E. An outline of forest pathology. Wiley, New York, 1931.

[2] Boyce, J. S. Forest pathology. McGraw-Hill, New York, 1938.

[3] Dr. Spaulding is in the Division of Forest Pathology, Bureau of Plant Industry, Soils and Agricultural Engineering, Agricultural Research Administration, U.S.D.A., cooperating with the Osborn Botanical Laboratory at Yale University.

and Chiapas. Here, in the southeastern corner of the State of Oaxaca, are the headwaters of the Río Chicapa, one of three rivers rising in this general region, all of which are on the explorers' itinerary. The highest point in the picture stands approximately 8,000 feet above sea level.

Mr. MacDougall and Mr. Alexander left New York the morning of Nov. 21 for their six months' expedition (described in last month's Journal) into little known parts of southern Mexico.

Meetings. Dr. William J. Robbins attended meetings of the National Academy of Sciences in Washington, D. C., and of the American Philosophical Society in Philadelphia during the week of Nov. 13.

Groups. Classes and clubs which have visited the Garden during the autumn months, to view the conservatories, outdoor borders, and adjacent trees and shrubs, have included groups from P.S. 17 at City Island, P.S. 114, Junior High School No. 44 in the Bronx, a Long Island City group of Cub Scouts, and members of a nursery school at Council House in the Bronx. A class from Hunter College under Dr. H. H. Clum was given instruction in practical gardening.

Library. Succeeding Mrs. Lazella Schwarten as Assistant in the Library at the New York Botanical Garden is Barbara Hoskins, a 1944 graduate of Wellesley College, where she majored in botany. Miss Hoskins began her work at the Garden Sept. 15, when Mrs. Schwarten became Librarian at the Arnold Arboretum.

Visitors. Norman Taylor, formerly a member of the staff of the New York Botanical Garden and now director of the Cinchona Products Institute, has recently returned from an extensive trip in South America. While there he collected a specimen of the dwarf alpine plant, *Werneria dactylophylla*, growing on bare soil at an altitude of just under 16,000 feet, which must be nearly or quite the extreme altitude at which flowering plants are able to survive in the Peruvian Andes. The preserved specimen has been added to the Garden's herbarium.

Dr. Carl Hartley, Principal Pathologist of the Beltsville, Md., Plant Industry Station of the U.S.D.A., visited the New York Botanical Garden Nov. 22 consulting with Dr. William J. Robbins and Dr. B. O. Dodge.

Dr. George Neville Jones of the University of Illinois spent several days in early November in the herbarium working on the genus *Amelanchier*.

Other visitors of recent weeks have included Dr. B. E. Dahlgren, Curator of Botany in the Chicago Museum (formerly the Field Museum); Dr. A. J. Grout of Newfane, Vt.; Col. A. Edward Sherman of La Mesa, Calif.; Dr. John D. Dwyer of Albany; and Edith Farrington Johnston of Bronxville, N. Y., illustrator of a forthcoming book on wild fruits.

Traveler. B. A. Krukoff left Nov. 10 for a brief trip to Costa Rica and Guatemala, in connection with the plantations of *Cinchona* (quinine) of Experimental Plantations, Inc., a subsidiary of Merck & Company.

Dr. Clyde Chandler and Ralph Pinkus, both formerly employed by the Garden, are now associated with Experimental Plantations, Inc., the former as a geneticist and the latter as manager of El Naranjo, one of the cinchona estates.

Conference. Reports from the Cleveland meetings of the A.A.A.S., which took place in September, were given at the first monthly conference of the scientific staff and registered students of the Garden Nov. 9.

Instructors. Dr. Louis Pyenson of the State Institute of Agriculture on Long Island is concluding the teaching in the class in Plant Pathology in the Garden's Two-Year Science Course for Gardeners. Lectures were given the first month by Dr. Cynthia Westcott of Glen Ridge, N. J., who has since gone south to continue her research on azalea blight for the U. S. Department of Agriculture. The two have been substituting for Dr. B. O. Dodge, who has just returned to his office after an extended illness.

Natural Science. The concluding lesson in the course in Natural Science for the Layman, conducted by Farida A. Wiley at the American Museum of Natural History, met at the New York Botanical Garden Nov. 4 and reviewed the two months of study during a walk through the grounds.

Winter Events at the Garden

Courses

IN the Two-Year Course in Practical Gardening, *Cultivation of Greenhouse Plants* will be taught by Joseph W. Tansey, Foreman Gardener at the New York Botanical Garden, who is directly responsible for the plants that are grown for indoor display. The class meets for two hours on alternate Thursday nights, beginning January 4 at 8 p.m. It will be followed in the spring by an eight weeks' practical course in indoor gardening.

Classes in the Two-Year Science Course for Gardeners will commence on Monday, January 8, with Dr. A. B. Stout teaching *Plant Breeding* at 8 p.m. and G. L. Wittrock teaching *Economic Botany* at 9 p.m.

All of these classes are open to both amateur and professional gardeners. Upon the satisfactory completion of the required two years of study in either one, a certificate is awarded by the Garden.

* * *

Saturday Programs

FREE programs given by the Garden on Saturdays at 3 p.m. will be resumed on January 13 with a motion picture. This will be followed by six illustrated talks on plants of the regions where our men in service are and have been located. Another motion picture will close the series of eight Saturday afternoon programs. The complete schedule will appear in the January Journal. Announcement cards will meanwhile be mailed free to anyone requesting them.

* * *

Radio Broadcasts

Edward Jerome Dies of Chicago, who is President of the American Soybean Association and the author of "Soybeans: Gold from the Soil," will give the initial broadcast of the new year for the New York Botanical Garden on January 12 at 3:30 over WNYC, speaking on "Streamlining the Age-Old Soybean." Announcement of the balance of the midwinter programs will be printed in next month's Journal.

* * *

Members' Days

A portrait of an early American botanist, José Mociño of 18th century Mexico, will be given in a talk by Dr. H. W. Rickett at the Members' Day program January 3. Announcements of this and future programs will be mailed to all members immediately after Christmas.

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An asterisk following a subject or a page number indicates an illustration or an illustrated article. The letter "R" preceding a page number refers to the Annual Report, which was issued as Section Two of the April Journal and paged separately. Except for activities of staff members, items appearing in Notes, News, and Comment and in the Current Literature column are not indexed. Book reviews are listed separately at the end of the general index, and are arranged alphabetically by authors' names.

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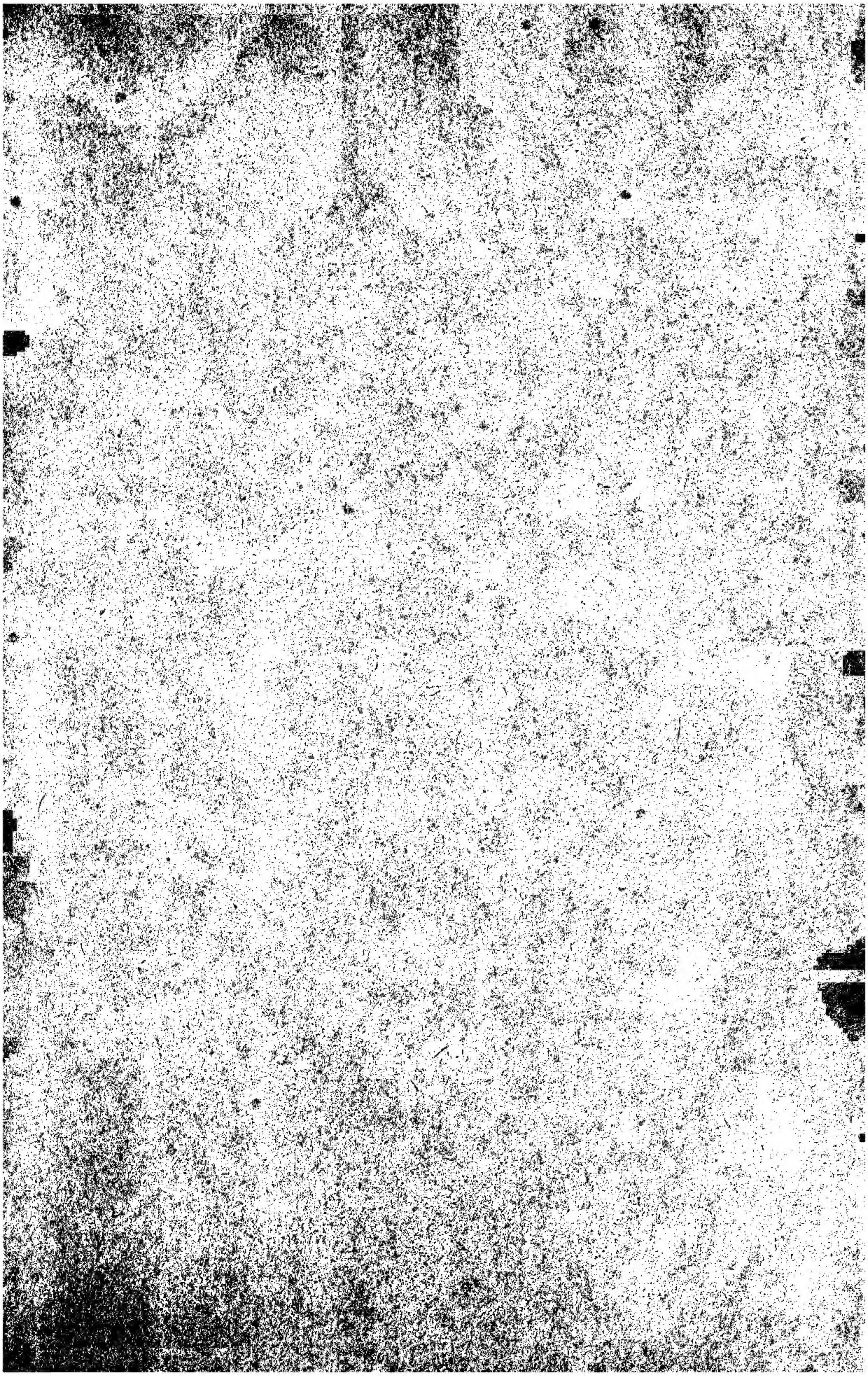
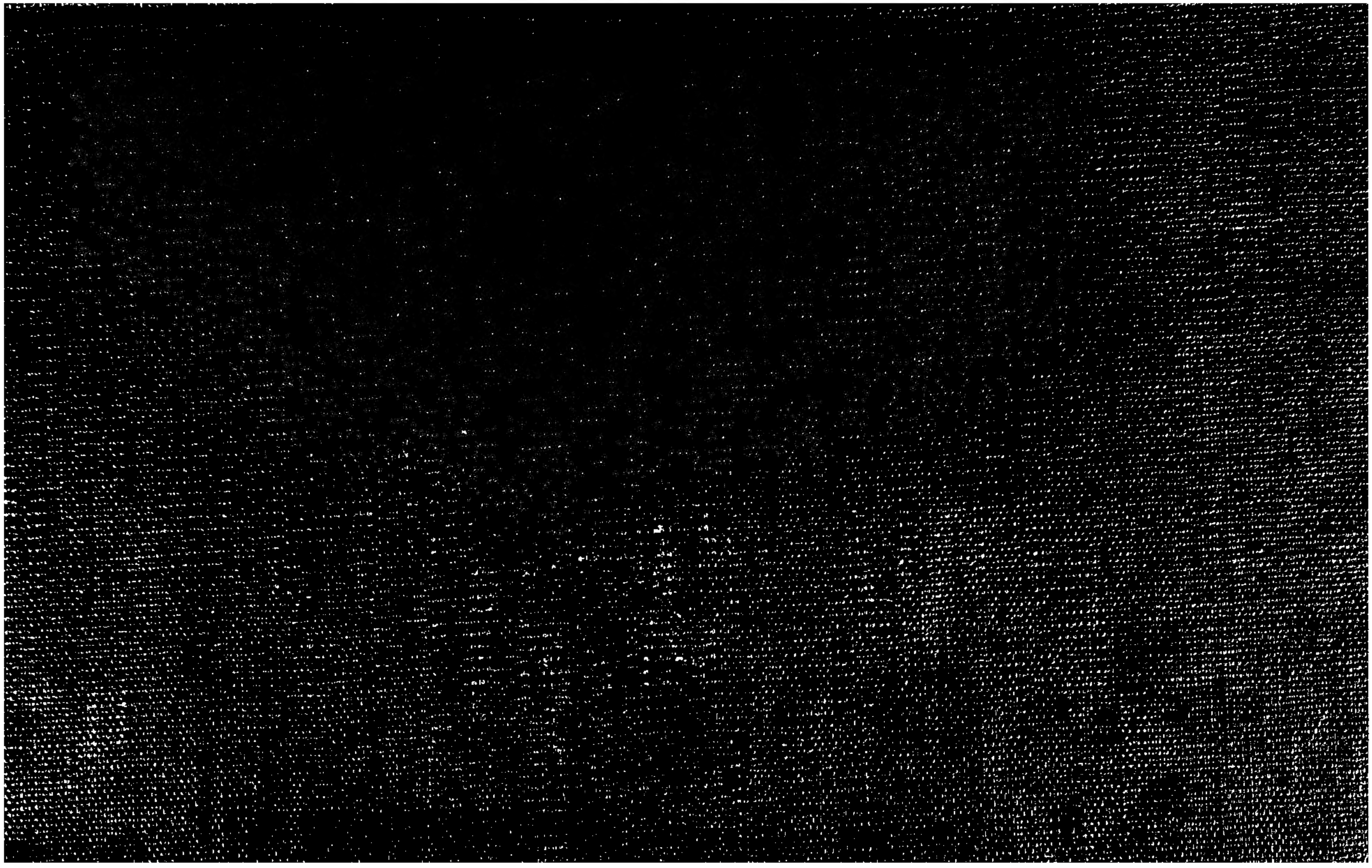
I hereby bequeath to The New York Botanical Garden, incorporated under the Laws of New York, Chapter 285 *of* 1891, *the sum of*_____.

Gifts may be made subject to a reservation of income from the gift property for the benefit of the donor or any designated beneficiary during his or her lifetime.

All requests for further information should be addressed to The New York Botanical Garden, Bronx Park, New York 58, *N. Y.*